THE COMPLETE

PRACTICAL FARMER;

BEING A PLAIN AND FAMILIAR TREATISE ON

THE CULTURE OF THE SOIL,

THE ORCHARD, AND THE GARDEN;

THE REARING, BREEDING, AND MANAGEMENT

OF EVERY DESCRIPTION OF

LIVE STOCK,

The Diseases to which they are subject, and the Remedies;

DIRECTIONS FOR THE MANAGEMENT OF

THE DAIRY;

A DESCRIPTION OF THE MOST USEFUL IMPLEMENTS OF HUSBANDRY;

And every information necessary to the practical Agriculturist.

ALSO, AN INDEX,

By which any subject can be instantaneously referred to.

IN THREE PARTS:

PART III. ON LIVE STOCK, UNDER THE IMMEDIATE SUPERVISION OF

R. H. BUDD, Veterinary Surgeon, New-York.

NEW-YORK.
VAN VLECK AND DAVENPORT, 155 BROADWAY.
1835.

Bernet & Douglas, Printers, Brooklyn

PREFACE.

In submitting the Complete Practical Farmer to the public, the proprietor takes the opportunity to observe, that it has been his endeavour to make it—what has long been wanting in this country—a complete system of practical farm management. With this view, no pains or expense has been spared; and having been entrusted to hands eminently qualified for the undertaking, it will, he thinks, bc found a valuable assistant to every Farmer—a companion to which he can refer for advice or assistance on every subject in any way connected with his occupation.

The very great improvements which have recently taken place in the agriculture of the United States, has rendered it seldom necessary, in the compilation of this work, to look abroad for information. The experience of Europe, however, has not been overlooked; and the latest discoveries and improvements of its agriculturists have been carefully examined, and the most important of them embodied in the pages of the Complete Practical Farmer.

The greatest care and attention has been paid in *arranging* the matter contained in the following pages, each subject having a distinct head, and every thing connected with such subject being placed under that head. By means of the Index, the Farmer will be enabled to turn *instantly* to any particular item which he may wish to look at.

INDEX.

CHAPTER I.

CLIMATE AND SOIL.

CLIMATE.—It is certainly of much importance to the farmer, that sufficient attention be paid to the nature of the climate in which his operations are to be carried on. Unless the system he adopts be calculated for the weather his crops are likely to experience, every exertion will often terminate in disappointment. The system that is proper for warm situations, is not suitable for cold and wet ones; and in a bleak and backward climate, the nature of the soil ought not only to be attended to, but the utmost care ought to be paid to the early sowing of the earliest varieties of seed. Even the species of stock to be bred, or kept on a farm, should in a great measure be regulated by the climate. Hence this is a subject which the diligent farmer will invariably study with the greatest solicitude.

In all cases, the effects of an unfavourable climate cannot be remedied by human effort. But they may in some; and for this purpose they should be ascertained, and the remedy, as far as practicable, applied.

SOIL.—As this is intended for a practical treatise, it will not be necessary to enter very fully into this subject. But a knowledge of the different sorts of ground which may come under the hand of the cultivator, is essentially necessary. From this he will know how to apply his labours, and to select such as is most proper for his use. All farms are not of the same quality; and the same farm is often of various qualities. By paying attention to the nature of the soil, and ascertaining the qualities it possesses, or by remedying its defects, the profits of a farmer may be greatly increased.

Soils may be considered under the following general heads: Sand, Gravel, Clay, Chalk, Peat, Alluvial, and Loam.

Sand. Sandy soils generally have a considerable mixture of other substances, by which their quality is greatly

ameliorated. The best method of improving the texture of such a soil, deficient in retentive or adhesive properties, is by a mixture of clay, marl, or such other substance, as will supply the existing defects.

Though sandy soils are not naturally valuable, yet they have some advantages. They are easily cultivated; are not so liable to injury from the vicissitudes of the weather; and in general have a dry soundness, accompanied by moisture, which secures excellent crops even in the driest summers.

Gravel. Gravelly soils differ very materially from sandy, both in their texture and modes of management. They are frequently composed of small soft stones, sometimes of flinty ones, but they often contain granite, limestone, and other rocky substances, partially but not very minutely decomposed. Gravel being more porous than even sand, is generally a poor and what is called *a hungry soil*, more especially when the parts of which it consists are hard in substance and round in form.

Gravelly soils are improved by deep ploughing; by mixing with them large quantities of clay, chalk, marl, peat, or other earth; by frequent returns of grass crops; and by repeated applications of manure.

Clay. A clayey soil is distinguished above every other for tenacity. It feels smooth and somewhat unctuous. If cultivated in a wet state, it sticks to the plough like mortar, and does not soon become dry.

The value of a clayey soil, depends materially upon its having an open subsoil, which renders it more tractable and productive. Its texture is ameliorated by a suitable mixture of common sand, sea sand, and above all of limestone gravel, where that can be obtained. Ploughing previous to Winter setting in, is of great use to clays, by exposing the surface to the frost, which mellows and pulverises it in a manner infinitely superior to what could be accomplished by all the operations of man. In this state the soil remains till Spring seed-time, when it is either ploughed with a shallow furrow, or merely scarified (which is the superior practice), and sown.

Peat. The improvement of peat bogs, and of all wet lands, must be preceded by draining, stagnant water being injurious to all the nutritive classes of plants. In converting peat into earth, it is a rule to plough or dig it in autumn, that it may be effectually exposed to the Winter's frost. If this labour be not commenced at a proper season of the year, and if the peat be once hardened by the Summer's sun, it is scarcely possible afterwards to decompose it.

Chalk. Chalky soils principally consist of calcareous mat-

ter, mixed with various other substances in greater or lesser proportions.

The means of improving chalky soils, are either by the application of clayey and sandy loams, pure clay, marl, or, where the staple is deficient, by using great quantities of peat.

Alluvial Soils. These are of two kinds: one derived from the sediment of fresh, and the other of salt, water.

Along the sides of rivers and other considerable streams, water-formed soils are to be met with, consisting of the decomposed matter of decayed vegetables, with the sediment of streams. They are commonly employed as meadows, from the hazard of crops of grain being injured, or carried off by the floods, if cultivated.

Loam. Where a soil is moderately cohesive, less tenacious than clay, and more so than sand, it is known by the name of *loam.* Loam is that species of artificial soil, into which the others are generally brought by the effects of manure, and of earthy applications, in the course of long cultivation; and is of various sorts.

Loams are the most desirable of all soils to occupy. They are friable; can in general be ploughed and cultivated with greater ease and facility, and less strength, than clay; bear the vicissitudes of the seasons, and seldom require any change in the rotation adopted. Above all, they are peculiarly well adapted for the convertible husbandry; for they can be changed, not only without injury, but generally with benefit, from grass to tillage, and from tillage to grass. They should not, however, be kept in tillage too long, nor whilst they are in cultivation should two white crops be taken in succession.

Subsoil.—The value of a soil depends much upon the nature of the subsoil, or under stratum. On various accounts, its properties merit particular attention. By examining the subsoil, information may be obtained in regard to the soil itself; for the materials of the latter are often similar to those which enter largely into the composition of the former, though the substances in the soil are necessarily altered by various mixtures in the course of cultivation. The subsoil may be of use to the soil by supplying its deficiencies, and correcting its defects. The hazard and expense of cultivating the surface, are often considerably augmented by defects in the under stratum, but which, in some cases, may be remedied. Disorders in the roots of plants, are generally owing to a wet or noxious subsoil.

Subsoils are *retentive*, or *porous.* A retentive, clayey subsoil, is in general found to be highly injurious, though it may

sometimes be of advantage to a sandy soil, by retaining moisture in such a manner, as to supply what is lost by evaporation, and the consumption of plants.

A porous subsoil is uniformly attended with this advantage, that by its means all superfluous moisture may be absorbed.

There is a most intimate connexion between the soil and subsoil; and the fertility of the former essentially depends on the quality of the latter. It is indeed evident, that the nature of the subsoil, as well as of the soil, must be ascertained, before a farmer can, with propriety, select his plants, determine on the species of manure to be employed, or arrange his course of cultivation. Such investigations, therefore, are of the highest importance to agricultural economy. They may be the means of explaining peculiarities and anomalies, which cannot at present be accounted for; and they may suggest the best methods of improving a soil, by correcting the defects in its constitution, and removing the causes of its sterility.

CHAPTER II.

MANURES.

It is a matter of the first importance to the cultivator, to possess an adequate *knowledge of the different substances* which may be used with advantage for fertilizing his lands; of the different soils to which such substances are best adapted; of the proper quantities to be used; and of the most advantageous time and manner of their application. There is but little even of the richest earths, that will not become exhausted by constant cropping without manure; and soils are seldom so sterile, but that with a proper application of suitable manures to them, they may be made to produce good and remunerating crops.

The term *manure* includes all those substances which, when artificially applied to, or blended with, the soil, are known from experience either to retrieve, to maintain, or to augment, its fertility, and to render it in any respect more favourable to vegetation. This includes all the articles which tend to correct any noxious ingredients in the soil, or to turn to greater utility certain substances previously contained in it.

In discussing this subject, attempts have been made by various authors to arrange these substances in a philosophic manner, and to explain their properties on chemical principles. In this work, restricted to practical information, it is intended to consider them under the heads of—Animal, Vegetable, Fossil, and Mixed.

Animal.—The flesh of animals is an excellent manure for all soils, and is used to a considerable extent on the sea-coast, where fish are caught in plenty. It is believed that flesh is used to most advantage in composts, and the same may be observed with more certainty in regard to the use of the blood. The shavings of the horny substances of animals, have very durable effects as a manure in dry soils, by enduing such with a greater power to retain moisture; and the same may also be said of the hair and wool. The bones,

being composed chiefly of phosphate of lime, either calcined, or broken into small pieces, or ground into powder, are exceedingly valuable, possessing properties which enrich the soil for a number of years. The miasma produced by the putrefaction of the flesh and blood of animals, is also food for plants, or at least its presence assists their growth. The urine is a fertilizer principally by reason of the salt it contains, and probably also by its producing miasma.

When animals die, it is usual to let them lie above ground, to the annoyance of the public; but if covered with earth, that, together with the flesh, &c. of the animal, would be converted into good manure.

VEGETABLE.—Of vegetable substances it may be generally remarked, that almost every sort of vegetable, not of woody texture, buried in the soil while green, is more or less efficacious as a manure; and that many sorts of these, when turned under where they grew, and while in a green state, will add much more fertility to the soil than their growth extracted from it; but that the same growth, when suffered to ripen on the ground, and then turned under, after the exhaustion of its juices, will not generally repay the soil the nutriment it extracted from it while growing. It would seem that the ripening of plants is the principal cause of the exhaustion of soils; and for this reason green dressings, that is, the ploughing of green crops under, has been found advantageous in enriching lands. Where green dressings are resorted to, as a manure, such growths should be selected for the purpose as are cheap in the article of seed, and at the same time quick and bulky in their growth. Buckwheat has been much used for the purpose, though perhaps some other plants should be preferred. The growth should be turned under when in blossom; and in order that this be done effectually, it should be laid prostrate by running the roller over it, in the same direction in which the plough is to follow; after which, the ground is not to be stirred again till this manure has sufficiently rotted. Generally, we think it would be most advisable to sow on the lay or furrow, by which the green crop has been turned under.

There may be some instances where manuring with green dressings may be advisable, particularly where it can be done without preventing the growth of any intervening crop. Where this is not practicable, we should hardly advise to this method of manuring, unless in cases where other manures are not easily to be obtained. One case we will mention, as an instance where a green dressing might be given to great

advantage. Suppose, for instance, a crop of rye, oats, or barley, harvested, and the ground cleared of the crop by the 20th of July. In that case, let the stubble be immediately turned under, and the ground harrowed in with buckwheat; by the 20th of September this growth would be fit to be turned under, when a crop of wheat might be sown on the lay. It should be understood, that rye is one of the best crops to precede a crop of wheat, or to follow it. In the same manner, therefore, the crop for a green dressing may be raised in the wheat stubble turned under, and the green crop turned under for a crop of rye.

Dung. But the contents of the barn-yard, and the excrements of cattle, are the principal sources of manure of the vegetable kind; and of these it is necessary to treat particularly, as well of the qualities of the different sorts, as of their most advantageous applications to soils.

The sorts of dung, or excrement, to be noticed, are those of *horses*, *neat cattle*, *sheep*, and *swine*. The dung of swine is most valuable, where properly applied; that of sheep is the next; that of cows ranks in the third degree, and that of horses in the fourth. The dung of the latter, if suffered to lie in a heap till it becomes thoroughly heated, assumes a whitish or mouldy colour, and is then of but little value. It is of a warm nature, and it is best adapted for being well buried in moist or clayey soils; cow dung, on the contrary, is most suitable for dry soils; sheep dung answers best on the soils for which that of horses is best suited, but is very valuable for almost any soil. Hog dung should only be applied to dry arable lands, and is most powerful in those of a sandy or gravelly nature. Dung, of all sorts, loses much of its valuable qualities by exposure to frequent rains, particularly when lying at but little depth over a considerable surface. Its good qualities are best preserved by lying in large heaps, and if under cover so much the better. The stercorary, or receptacle for liquid manure and dung, is the most effectual method for preserving barn dung, and it is believed that every farmer will find his money well expended in the erection of this receptacle for the contents of that part of his barn yard which is not used in the spring. The liquid that runs from the heap is the most valuable part, and should never be lost: the stercorary is therefore calculated to preserve it; and for the purpose of absorbing the whole of it, any dry vegetable matter, or rich earth, may be laid over the heap, and this liquid then thrown on that, which will serve to convert the whole into good manure. The juices, and the soluble and gaseous parts of the excrements of cattle, together with the stale, are what

principally affords nutriment for growing plants; and every means by which these can be saved, by their being absorbed in other substances of rich earthy or vegetable matter, would seem to be well worthy of attention.

Where lands are in grasses of the fibrous rooted kinds, it is the generally received opinion of the best cultivators, that barn dung, as well as manure of every other kind, should be applied as a top dressing, that is, by spreading it on the surface; but that for tap-rooted grasses, or those whose roots extend deeply, as well as for all grain and root crops, this manure should be buried in the soil, at such depths as may be best suited to the nature of the roots of the plants to be cultivated. The operation of barn dung, and of all vegetable and animal substances used in manure, seems to be this: if laid at a certain depth beneath the surface of the soil, in the progress of their decomposition their soluble parts pass into the form of gas, or vapour, and of course rise to the surface, and in their ascent are more or less absorbed by the roots of the plants; on the contrary, if these manures be laid on the surface, the soluble parts, in the progress of decomposition, never become æriform, but are washed downwards in their liquid state, where they are in like manner absorbed by the roots of the plants. This is probably as correct an explanation as can be given of the effect of these manures. It is well known, that ground long used as a grave-yard becomes very fertile, notwithstanding the substances which are the cause of such fertility, are laid at a very great depth.

It has been held by some English writers, that barn dung should be well rotted previous to its application as a manure; but this opinion is rejected by Sir Humphrey Davy, one of the most scientific agriculturists England ever produced, and also by Arthur Young, Esq. Mr. Davy contends that this manure may in most instances be as well applied fresh as in any other way, by its being laid at a proper depth beneath the surface, and that in scarcely any instance is it advisable that it should undergo more than the first stage of decomposition before it is used. When well rotted it is, however, more efficacious for a single crop, but its use is of much shorter duration. It seems, also, to be generally agreed, that using this manure for drill crops, burying it at a good depth, and raising the plants over the dung thus buried, is the best possible way in which it can be used. We have seen repeated accounts of from 90 to 100 bushels of Indian corn to the acre, by this mode of culture. The success of Mr. Cobbett, and others, in raising great crops of Ruta Baga by this method of using this manure, seems to demonstrate its utility, if

further evidence were wanting than what has appeared in English and American publications on the subject.

The plan that we would therefore recommend is, to apply the fresh barn dung to all drill crops which are to be put in the ground in the spring. The shortest dung should be used for these purposes, except for potatoes, and it should, as far as practicable, be applied to the soils best adapted for each kind of dung. The longer, or more strawy parts of the dung, we should advise to be laid in the stercorary, if that place has been provided, or else somewhere under cover; or if no cover can be afforded, let it be thrown in a heap about three or four feet high; and wherever it be laid, let it be stirred up from the bottom in the course of about five or six weeks after it has been thus heaped or otherwise stored away, after which it will soon be found well fitted for being used for the crop of Ruta Baga. It is also advisable to cover the heap with a layer of good earth, which will serve to absorb and retain much of the steam or gaseous matter that rises from the heap, and when saturated with this, and mixed with the mass of dung, will be found a valuable addition.

Fossils. Of the manures which may be termed Fossils, we will mention the various kinds of calcareous substances, the stoney matter called pyrites, coal, salt, aluminous earths, and peaty substances.

Calcareous substances are limestone, gypsum, chalk, and marle.

Limestone (carbonate of lime) always possesses more or less aluminous or silicious earth in its composition. Very frequently, also, it contains magnesia. Limestone of this latter description, when calcined, makes what is generally called *hot* lime, which is more powerful in its effects, and therefore less of it should be applied at once to the soil. That without any admixture of magnesia is considered more durable in its operation, but less powerful. Magnesian limestone is known by its effervescing but little when plunged in nitric or other acid, while limestone that is not magnesian, when thus immersed produces a strong effervescence. The magnesian, also, when immersed in diluted nitric acid, or aqua fortis, renders the liquid of a milky appearance. It is usually of a brownish or pale yellow colour. Being more caustic, when calcined, than common limestone, it is more efficacious in decomposing peaty earths, and is best adapted for soils which have too much peaty or vegetable matter in them. Where lands have been injured by too plentiful an application of this lime, peaty earth should be applied to them to correct the evil.

The trials of lime in this country have been quite limited, and confined principally to the middle states, particularly Pennsylvania. It has usually been applied there at the rate of about forty bushels to the acre; but whether the lime used there is magnesian, we have never understood. Lime may be applied as a top dressing, or mixed with the soil. Its application has been found most successful, when the first succeeding crop was Indian corn; afterwards, wheat is grown to advantage. Instances are mentioned in the memoirs of the agricultural society of Philadelphia, where gypsum had no effect on worn-out lands, till they had been first manured with lime.

British writers say that lime may be applied with equal advantage either when newly slaked, or afterwards; that its effects are not always the same, particularly where soils are different, but that usually it is a very durable manure. A much larger quantity is, however, applied in Great Britain, than has been usual here; but perhaps the coolness of the summers there renders more requisite. We pretend to advise to no particular rules in the application of lime in this country, farther than that about forty bushels to the acre be first tried; but less for sandy soils, and perhaps more for those which are stiff clays, would be advisable. In clays of this description, lime is particularly useful in destroying the adhesive quality of such soils, and thereby rendering them a mere friable loam. Such has been its effects on the clay lands which abound so much in England. Where the lime is magnesian, let trials be made of about twenty bushels to the acre.

Chalk. Great Britain abounds much in the calcareous matter denominated chalk, which is also converted into lime by calcination, and used as a manure. It forms a weaker sort of lime. As this substance, however, is hardly to be found in this country, it will be unnecessary further to speak of it.

Gypsum (sulphate of lime) is a most powerful stimulant to the growth of many crops in all dry soils in this country, but with the following exceptions: It has no sensible effect on lands newly cleared, on those in the vicinity of the ocean, nor on those which have been completely exhausted by severe cropping. In soils of this latter description, some pabulous matter must be given them for the gypsum to digest or act upon; and this may be a previous manuring with lime, marle, bog-earth, barn dung, or perhaps any substance that is calculated to improve the condition of the soil. It should also be observed that the application of gypsum frequently fails entirely of producing its effects if followed by uncommon drought, or

unusually wet weather. It is generally most powerful when applied to growths of leguminous plants, to those extending in vines, such as the various species of the gourd tribe, the strawberry, &c. and to several sorts of the green crops, particularly potatoes, clover-grasses, lucern, &c. On fibrous rooted grasses, and those grain plants most nearly related to them, such as wheat, rye, oats, barley, &c. it has no sensible effect when applied as a top dressing to the growing plants. On buckwheat, it is very powerful, and for Indian corn it is also valuable. Judge Peters, (of Penn.) whose experience of its uses has been long and extensive, says that although he has found this manure of little use to many sorts of plants, when applied to them as a top dressing, yet he has invariably found that all plants derive benefit from their seeds being rolled in gypsum, after being soaked in some liquid, before sowing or planting. As a manure, however, for wheat or grain crops of similar kinds, immense benefit may be derived from it by applying it to the sward, as a top dressing, a suitable length of time before the ground is broken up. In this way two bushels of gypsum may be made to give an additional increase of eight or ten bushels of wheat to the acre; in the Fall or early in the Spring, give it a top dressing of two bushels of gypsum to the acre; by the middle of June following, the land will exhibit a fresh green sward, principally of white clover; and when land is thus clothed in verdure, it is a sure indication of a great addition to its fertility, and that a good crop may then be expected. When, therefore, the green sward is thus formed, turn it under, and then, with the usual culture, twenty bushels of wheat to the acre may be expected, where only ten would have been had without this previous enriching of the ground by the application of gypsum. Yet the same quantity of this manure, applied as a top dressing to the growing crop of wheat, would have had no sensible effect. It should therefore be understood, that for all growths which derive little or no benefit from gypsum, when applied as a top dressing to the growing plants, the ground should be previously enriched by applying this manure to the sward, a suitable length of time before it is to be broken up, which length of time will usually be from two to three months. At all events, as soon as the sward fully exhibits the effects of the gypsum, it may then be turned under. Wherever a sward is to be turned under, this practice should be invariably pursued, in order that the ground be rendered more fruitful for the crop that is to follow.

In this country, gypsum is a great source of wealth, wherever soils are sensible to its effects. It has tended much to equalize the value of lands, by imparting an artificial fertility

to those naturally more sterile, and that at a small expense. But gypsum alone is by no means a sufficient source of dependence as a manure, for keeping lands in the improved condition that is necessary for raising the best crops, and of course deriving the greatest profits. The farmer should attend also to making the most of such other manures as come conveniently within his reach. We are, however, no advocate for obtaining manures at any price; they may cost too much; but almost every farmer, whose lands are of suitable quality, and who stocks them with as many cattle as he can keep in good order, and then makes the best use of the manure they afford, may usually, with this supply, and with the judicious use of gypsum, added to good culture, keep his lands in an improving condition.

Marle. Some soils are so constituted as to be of diminished value without a suitable mixture of other earths than those of which they are composed, and in such case are permanently benefited by such additions of earthy substances. If lands, for instance, are too sandy, or gravelly, the addition of clay to them, or what is better, of upland marle, will permanently improve the soil; and where these earths can be found within reasonable distance, it will usually be labour well expended in making such applications. We will state a case in point. In the rear of the city of Albany lies an immense body of calcareous earth, which may properly be called a schistic marle. It is commonly called blue clay. This, when mixed with a due proportion of sand, forms a very fertile and durable soil. Farther west of the city lie large tracts of sandy lands, which require suitable proportions of this marle to render them fit for good culture, and with such additions much of them would be found very valuable. Where they lie sufficiently level, and are not too sandy, it will probably be found that from half a ton to a ton for every rod square, would be sufficient to render them very fertile, and fitted for the most profitable rotation of crops.

This sort of marle, which may be found in various parts of the country, and very frequently under tracts of sandy lands, is a valuable and permanent manure in all dry soils which are deficient of calcareous matter, and have not already too great a proportion of clay in their composition. This manure should be laid on the land as a top dressing, in order that it may be completely pulverised before it is mixed with the soil.

Upland marle is sometimes found of silicious texture, in which case it is good for stiff soils, as well as for others. It is also found of different colours, when combined with argillaceous matter, and of different qualities; that containing most

lime or calcareous matter being always the best. Marles of this description are often very valuable in forming a principal ingredient in composts, of which we shall presently speak, and the same may be observed of the superior sorts of this manure found in bog swamps, of which something shall now be said.

This sort of marle is found, at greater or less depths, beneath the surface of many bog swamps, and is of a whitish, greyish, or brownish colour. The whitest is the most powerful, having most lime in its composition; the greyish is next in quality.—The super stratum is either a bog earth, to wit, vegetable matter totally decomposed; or it is a peaty substance, or vegetable matter in a partial state of decomposition. The bog earth is a good manure of itself, and may be used separately, or mixed with the marle; the peaty substance must undergo a further decomposition before it is rendered valuable as a manure, it being then rendered similar to bog earth. These manures when applied to growing crops, are somewhat similar in their effects to those of gypsum. They are valuable as top dressings, or for mixing with the soil. Their effects are very powerful on Indian corn, and they are more or less valuable when applied to almost every sort of upland crop, with the exception of wheat, rye, barley, &c. For these they are to be applied to the sward, a suitable time before breaking it up, as has been mentioned in regard to gypsum. It should, however, be observed, that neither decomposed peat, nor bog earth, should be applied to soils which already contain too great a proportion of decomposed vegetable matter.

The condition of clay soils is also permanently improved by mixing a due proportion of sand in them. The most durable and perfect soil is chiefly composed of certain proportions of sand, clay, lime, and vegetable matter in a state of decomposition; and whenever any soil is destitute of a due proportion of any of these, the addition of such earthy substance can never fail to serve as a manure.

Pyrites. The stony earth called Pyrites, when pulverised by the aid of a proper degree of calcination, is much used, and highly esteemed in Flanders as a top dressing for grass lands, as is mentioned in a communication of the late Chancellor Livingston to the Society for the Promotion of the Useful Arts in the state of New-York. We will refer the reader to the 2d vol. published by that Society, for the manner of preparing this manure, and the quantity to be used, &c.

Coal. Of Coal, we shall merely state that, from the results of experiments made by the late Mr. Muhlenburg, of Pennsylvania, about forty bushels to the acre of this substance, pulverised in the manner of gypsum, was found a good manure, when applied as a top dressing.

Salt. Common Salt, pulverised, and applied as a top dressing, at the rate of from two to four bushels to the acre, has, in many instances, powerful effects as a manure. Sea-water is peculiarly adapted for this purpose. Mr. Deane, in his Farmer's Dictionary, mentions an instance where a crop of potatoes, and another of flax, were greatly increased in product by an application of sea-water to them while growing. About a pint of the water was applied to each hill of potatoes, and for the flax crop the water was sprinkled over the ground.

Aluminous Earths. Some trials have been made in this country of using burnt clay as a manure, and its use is recommended, particularly for all dry arable lands, not inclining to clay. The first step in preparation for burning clay, is to have a considerable quantity of this earth dug up in spits, and laid to dry in the sun: when pretty well dried you prepare for burning by raising a little pile of dry wood in the shape of a pyramid, say 4 or 5 feet high; —round this you build up the dried spits of clay, leaving a hole at the bottom, for the entrance of the air, and another at the top for it to pass off. Such, at least, was the method formerly practised in Great Britain, but the modern improvement of retaining the smoke within the mass, agreeably to the plan spoken of by Mr. Cobbett, for burning earth, ought also to be pursued in burning clay. After the fire has been set to the wood you continue digging up fresh clay and piling it around and over the heap, as fast as the fire penetrates the mass, taking care, however, not to pile on so much at once as to extinguish the fire. If there be danger of its becoming extinguished, it may be advisable to make one or more holes in the sides of the heap by running a pole into it. The fresh earth is to be added during pleasure or until a sufficient quantity is burned. After the heap has cooled it is fit for use, either by mixing with the soil as directed by Mr. Cobbett, for applying burnt earth, of which we will next speak.

By a late improvement, earths, other than those of clay, are successfully converted into good manure, by the process of burning. It is effected by retaining the smoke within the mass of earth while in a state of ignition. Mr. Cobbett says he has tried this manure for the Ruta Baga crop, and found it as efficacious as barn dung. His manner of preparing it, and which we believe would also be the best method of preparing burnt clay, is as follows:

"I make a circle," says Mr. C. "or an oblong square. I cut sods and build a wall all round three feet thick, and four feet high. I then light a fire in he middle with straw, dry sticks, boughs, or such like matter. I go on making this fire larger and larger, till it extend over the whole bottom of the pit or kiln. I put on roots of trees or any rubbish wood, till there be a good

thickness of strong coals. I then put on the *driest* of the clods that I have ploughed up round about, so as to cover all the fire over. The earth thus put in will burn. You will see the smoke coming out at little places here and there. Put more clods wherever the smoke appears. Keep on thus for a day or two. By this time a great mass of fire will be in the inside. And now you may dig out the clay, or earth, any where round the kiln, and fling it on without ceremony, always taking care to *keep in the smoke;* for, i you suffer that to continue coming out at any one place, a hole will soon be made; the main force of the fire will draw to that hole; a blaze, like that of a volcano, will come out, and the fire will be extinguished.

"A very good way is to put your finger into the top of the heap here and there; and if you find the fire *very near*, throw on more earth. Not *too much at a time*, for that weighs too heavily on the fire, and keeps it back; and, at *first* will put it partially out. You keep on thus augmenting the kiln, till you get to the top of the walls, and then you may, if you like, raise the walls, and still go on. No rain will affect the fire, when once it is become strong.

"The principle is to *keep out air*, whether at the top or the sides, and this you are sure to do, if you *keep in the smoke.* I burnt, this last summer, about thirty wagon loads in one round kiln, and never saw the smoke at all after the first four days. I put in my finger to try whether the fire was near the top; and when I found it approaching, I put on more earth. Never was a kiln more completely burnt.

"Now this may be done on the skirt of any wood where the matters are all at hand. This mode is far preferable to the *above ground* burning in *heaps*. Because in the next place, the *smoke escapes there*, which is the finest part of the burnt matter. *Soot*, we know well, is more poweful than ashes, and, soot is composed of the *grossest parts of the smoke*. That which flies out of the chimney is the best part of all.

"In case of a want of wood wherewith to begin the fire, the fire may be lighted precisely as in the case of *paring and burning*. If the kiln be large, the oblong square is the best figure. About *ten feet wide*, because then a man can fling the earth easily over every part. The mode they pursue in England, when there is no *wood*, is to make a sort of building in the kiln with turfs and leave air holes at the corners of the walls, till the fire be well begun. But this is tedious work; and is in this country wholly unnecessary. Care must, however, be taken, that the fire be well lighted. The matter put in *at first* should be such as is of the lightest description; so that a body of earth on fire may be obtained, before it be too heavily loaded.

"The burning being completed, having got the quantity you want, let the kiln remain. The fire will continue to work, until all is ashes. If you want to *use* the ashes sooner, open the kiln. They will be cold enough to remove in a week."

A practice has long prevailed in Europe of paring and burning soils for the purpose of improving their texture and increasing their fertility. On clay lands, and such as contain too much vegetable matter, we conceive the process might be advisable, if not too expensive. Its effect on clays is to destroy the adhesive quality of the soil, as the earth burned becomes rather of a silicious texture; and at the same time the surface is much enriched by the operation. In the other case it is calculated to reduce the redundancy of vegetable matter, as well as to enrich the soil. The operation is performed in the following manner:

When the ground is in a good sward of grass, let it be carefully turned over with the plough, the irons of which should be well sharpened. Let the plough run about three inches deep. Then cross plough with a very sharp coulter, and the sward will all be cut into squares of about 10 or 12 inches. You then proceed to set these square chunks up edgeways, by leaning two together, in which situation they will soon dry. When well dried build a part of them up in the form of little ovens, and let this be done at the distance of about every 18 feet each way. These are all to have a little opening or door, at a common windward side, for the air to enter, and another opening above for the smoke to pass off. On some dry day, when the wind is fair for blowing into the holes below, place some straw or other dry rubbish into the holes, and set fire to it. As soon as the fires have got fully going in each of the heaps, let the holes in the tops be stopped up, for the purpose of retaining the smoke, and keep gradually building up the heaps as the fire penetrates them, until all the chunks of earth are piled up round them; and when the heaps have fully burned and sufficiently cooled, they are to be evenly spread over the ground, and ploughed in.

Peaty substances. In some parts of Great Britain it has been the practice to burn Peat earth, in a manner very similar to that before described for burning clay, and the ashes thus obtained from the mass were used for top dressings; but we believe this practice has mostly given way to that of rotting or decomposing peat in compost, the method of which is as follows: You form the compost heap of about one half of peat, a fourth of lime, and a fourth of barn dung, and these substances are to be separately laid along in a manner most convenient to be afterwards thrown into the compost heap in their proportions. You commence at one end with spreading a layer of peat on the ground, say, ten feet square and four inches in depth; then a layer of lime on this,

and another of barn dung, each two inches thick; then another layer of peat, as before, and then the lime and barn dung, as before, until in this way the heap is raised about four feet high, and let the last layer be of peat: Then commence another ten feet square along side of this, and raise it, as before, till you raise it to the same height; then with another ten feet square, at the end of this mass, and so on, till the heap is completed. After the heap has stood awhile, it will heat, and when the heat begins to subside, you commence again at one end of the heap and cut the whole down to the bottom, with the spade, and form a new heap, throwing the exterior parts of the heap, thus cut down, into the middle of the other. A second heating of the mass will then commence, and when that subsides, the peat will be found sufficiently decomposed, and the whole an excellent mass of manure.

In this country peaty substances are usually to be found in morasses; as the super stratum of marle, as before mentioned; as the principal ingredient of the salt marshes contiguous to the ocean, and as the super stratum of tracts of cold lands which are covered with growths of evergreen trees.

In making composts with upland marle, before mentioned, the proportions of the marle, with that of the lime and dung, may be similar to those just mentioned for the peat composts, or perhaps the marle may be in greater proportion. The layers of each may be as before described, but the heap only raised to such a height that it may be cleft down to the bottom with the plough, then thrown together in a ridge again with this implement; and let these operations be repeated, at intervals, till the whole becomes well mixed, pulverised, and in a state of fermentation, when it is fit for use, and should be immediately applied to the soil in the manner before mentioned.

Wood Ashes. The use of wood ashes as a manure, is well known. It is good for almost all crops, and is to be used as a top dressing. It is much more efficacious as a manure in some parts of the country than others, particularly on Long Island. It is most valuable on light dry soils, particularly those which are sandy. Soot, as a top dressing, is much more valuable than ashes, and is proper for almost all arable lands. It is most efficacious when well pulverised before its application.

The dung of fowls of every sort has much calcareous matter in it, and is very efficacious applied as top dressings. Malt dust is good in the same way—40 bushels per acre is a proper allowance.

Night soil should be mixed with earth, say, two-thirds of the latter to one of the former, and in the course of a few months it forms an excellent manure. In most European cities this excrement is carefully collected, for manure, while in this country its use has been neglected.

Many liquids are furnished from every house, and particularly the kitchen, which, mixed with earths, and other substances, would form valuable masses of manure. The liquids to which we principally refer, are the soap-suds, dish-water, brine of meat, urine, &c.—these should all be preserved, by being absorbed in rich earthy substances, together with the contents of the hog-stye; and in this way a large heap of good manure may be made, that is commonly lost for want of attention in saving these ingredients.

CHAPTER III.

COLLECTING, PRESERVING, AND APPLYING MANURES.

General Observations.—Manures to a farm are what blood is to the human body. The first object of a farmer should be to obtain, and preserve in the best manner, all the animal, vegetable, and compost manures, which can be made upon his farm, or procured elsewhere; but unless properly preserved, much of his labour is wasted, and his lands are less productive. Fair experiments have clearly proved, that the manure of cattle, preserved under cover, or in vaults under barns, possesses a third more value at least, than the same kind which has remained exposed to rains and the action of the atmosphere. This will not be doubted by any one who has any correct information upon the subject, or has by experiment ascertained the difference. We cannot well explain the reason of this great difference, without adopting the style and terms of the Chemist; but as our object is not to enlighten the learned, we therefore reject technical terms, and use language more familiar.

Vegetation is caused, not so much by the quantity of manure mixed in the soil, as by its nutritious qualities. Should all farmers understand the fact, that none of the earthy or solid part of manure enters into plants, or in other words, that it is *only the liquid parts, or that portion of the manure which combines or unites with water, which produces vegetation*, or causes the corn to grow, they would then perceive the necessity of preserving animal manure in vaults, under cover. The only value which the earthy part of the manure has, is to keep the soil into which it is ploughed, in a loose, pulverised state, so as to render it capable of retaining, after rains, a greater quantity of moisture.

Some farmers have expressed an opinion, that the urine of cattle promotes vegetation as much as their manure. But whatever may be the difference in value, it is surely very important that the urine should be preserved in vaults, and mixed with the manure.

In the Spring, when the manure is conveyed into the field, it

should be ploughed in immediately, and spread no faster than becomes necessary for ploughing; because at this season, the warmth of the sun produces a rapid fermentation, and the most valuable, or liquid part of the manure, escapes in the form of gas, or as it is often expressed, by evaporation.

Should a heap of manure at this season be covered with earth two feet deep, in a short period the whole mass of earth would be enriched by the gas arising from the fermenting manure.—Hence the utility of covering fresh barn-yard manure with earth, straw, litter, weeds, street and door-yard scrapings, mud from swamps, and all kinds of decomposed vegetable matter. Skilful farmers will always make as large a quantity of compost manure as possible. It is a very certain way to enrich a farm, and insure abundant crops. If these truths are conceded, then it conclusively follows, that the general practice of our farmers in respect to manures is injudicious. They let the manure lie in large yards, exposed to heavy rains and the action of the atmosphere. A large portion of the nutritive qualities escapes in gas, or is washed away by the heavy rains. The greater the exposure to the atmosphere, the greater the loss. Therefore the practice of carting out the barn-yard manure in the Fall, and spreading it in small heaps upon the soil intended for ploughing in the Spring, is still more censurable. But the Fall manure is often carted into the fields, and deposited in one or two large heaps to rot, for the purpose of manuring the corn and potatoe hills in the Spring; and strange as it may seem, many old farmers yet believe that old rotted manure promotes vegetation better than fresh, or unfermented manure! They appear to be ignorant of the fact, that the longer manure remains exposed to rot, the less nutriment or food for plants it retains, and the more it becomes assimilated to mere earth.

To put either fresh or rotted manure in the hill, in the season of planting potatoes and corn, as a general practice, is injudicious. But half the quantity of fresh, unfermented manure, in the hill, well mixed in the soil, would afford probably more nutriment than double the quantity of old rotted manure.

The moisture necessary to vegetation is conveyed to the roots of young trees, or the corn, or other plants, through the medium of earth. If any light or dry material is in contact with the roots, it tends to cut off the regular and natural supply of water, and the plant must either extend its roots through the dry substance to draw its requisite supply of moisture, or else become feeble, and perhaps perish. Hence, in a dry season more particularly, manuring in the hill often proves very injurious to the growth of plants. If manuring the corn hill is ever judicious, it is only on a cold, moist, and sterile soil, or swarded land deeply ploughed,

where the farmer has not a sufficient quantity of manure to mix in the soil. The surest method to enrich the soil for future years, is to plough in the manure. The roots of corn, extending several feet around the hill, will find whatever nourishment the soil contains; and it is far better to afford a sufficient supply when the corn is coming to maturity, than merely to force the kernel to vegetate a few days earlier by means of a hot-bed.

Our preceding remarks show the importance of covering manure well with earth, previous to its fermentation. The common practice, therefore, of spreading the manure upon the surface, and "harrowing it in," is attended with great loss, as a large portion will remain dry upon the surface, and for no other use than to enrich the atmosphere.

Manure being the life of a farm, every exertion should be used to procure all kinds of it. Compost, soot, ashes, lime, gypsum, burnt clay or soft bricks pulverised, decomposed vegetable substances, weeds, leaves of trees, coarse grass, &c. will all tend to fertilise the soil. None are ignorant, that such as is taken from the vaults, afford the greatest quantity of nutriment to plants. On farms it ought never to be lost. The yards for swine ought always to be excavated, or be, in the form of a basin, so that this manure, in richness next to the last, should be preserved in a moist state. The same remark applies to the barn-yard for other cattle, except that the other ought to have a level and dry margin for feeding cattle occasionally. Soon after planting in the Spring, a farmer ought to commence hauling into these yards the different substances we have enumerated, and any others within his reach which can be converted into manure. These substances will become incorporated with the manure of the cattle, and also absorb their urine, and the whole mass will be less liable to dry up and waste in the summer season.

A good farmer will be careful to yard his cattle at night as much as practicable through the warm, and in the day-time in the winter seasons. It has been found to be very beneficial to keep the cattle yards in a moist state by means of aqueducts, whenever practicable. In fine, farmers should spare no labour or expense to obtain a plentiful supply of manure to fertilise the soil. Their liberality to "Mother Earth," will be repaid with equal abundance.

In England, nothing is lost which can be converted into manure. And some English farmers fertilise their fields, in part, with the pulverised bones of human animals; and for this purpose, have even gathered bones from the plains of Waterloo.

THE CATTLE OR FARM-YARD.—Every farmer does not correctly appreciate the influence which a proper management and

application of manure have on his crops. Hence arise inconsistencies, and a want of system in his husbandry. He fences in his fields, and carefully secures his crops; but whilst his cattle are consuming them in the Winter, they are permitted to drop their dung in the road, and by the side of streams, to be washed from his farm. Like a severe taskmaster, he makes *the same exactions* of his fields, without supplying them with the *means* of performing their annual tasks.

The farm-yard is the greatest source of manure. On its situation and construction will depend considerably, the quantity which will be *made* and *preserved*. These objects require that the yard should not be too extensive, be raised at the borders, and have a good and firm bottom.

The best directions we have met with on this subject, are contained in a paper by Jesse Buel, Esq. of Albany, published in the Memoirs of the Board of Agriculture of this state. Judge Buel is one of our very best agriculturists; he says, the cattle-yard should be located on the south side of, and adjoining, the barn. Sheds, substantial stone walls, or close board fences, should be erected at least on the east and west sides, to shelter the cattle from cold winds and storms—the size proportioned to the stock to be kept in it. Excavate the centre in a concave form, placing the earth removed upon the edges or lowest sides, leaving the borders ten or twelve feet broad, and of a horizontal level, to feed the stock upon, and from two to five feet higher than the centre. This may be done with a plough and scraper, or shovel and hand-barrow, after the ground is broken up with the plough. When the soil is not sufficiently compact to hold water, the bottom should be bedded with six or eight inches of clay, well beaten down, and covered with gravel or sand. This last labour is seldom required, except where the ground is very porous. Here should be annually deposited, as they can be conveniently collected, the weeds, coarse grass, and brake of the farm; and also the pumpkin vines and potatoe tops. The quantity of these upon a farm is very great, and are collected and brought to the yard with little trouble by the teams returning from the fields. And here also should be fed out, or strewed as litter, the hay, stalks and husks of Indian corn, pea and bean haulm, and the straw of grain not wanted in the stables. To still further augment the mass, leached ashes and swamp earth may be added to advantage. These materials will absorb the liquid of the yard, and, becoming incorporated with the excrementitious matter, double or treble the ordinary quantity of manure. During the continuance of the frost, the excavation gives no inconvenience; and when the weather is soft, the borders afford ample room for the cattle. In this way the urine is saved,

and the waste incident to rains, &c. prevented. The cattle should be kept constantly yarded in winter, except when let out to water, and the yard frequently replenished with dry litter. Upon this plan, from ten to twelve loads of unfermented manure may be obtained every Spring for each animal; and if the stable manure is spread over the yard, the quality of the dung will be improved, and the quantity proportionably increased. Any excess of liquid that may remain after the dung is removed in the Spring, can be profitably applied to grass, grain, or garden crops. It is used extensively in Flanders, and in various other parts of Europe.

The food of vegetables being thus procured and preserved, it should be given every Spring to such hoed crops as will do well upon coarse food. These are corn, potatoes, ruta baga, beans, and cabbages. These consume the coarse particles of the manure, which would have been lost during the Summer in the yard; while the plough, harrow, and hoe, eradicate the weeds which spring from the seeds it scatters. The finer parts of the food are preserved in the soil, to nourish the small grains which follow. The dung is spread upon the land as evenly as possible, and immediately turned under with the plough. It is thereby better distributed for the next crop, and becomes intimately mixed and incorporated with the soil by subsequent tillage.—Thus, upon the data which I feel warranted in assuming, a farmer who keeps twenty horses and neat cattle, will obtain from his yards and stables, every Spring, 200 loads of manure, besides what is made in Summer, and the product of his hog-stye. With this he may manure annually ten or twelve acres of corn, potatoes, &c. and manure it well. And if a proper rotation of crops is adopted, he will be able to keep in good heart, and progressively to improve, sixty acres of tillage land, so that each field shall be manured once every four or five years, on the return of the corn and potatoe crop.

The Stercorary.—The stercorary is a place properly secured from the weather, for containing dung. In collecting manures from time to time, as they come to hand, farmers generally keep them together in what they call dunghills, where they remain exposed to the heat of the sun, the washing of rains, and the drying winds; by which means a great deal of their virtue is dissipated and lost. The making of *stercoraries* has therefore been advised.

The situation best calculated for the site of a dunghill, is that which is nearest to a level, with a bottom capable of retaining moisture, and if possible to be covered with a shed. The whole should be inclosed with a wall at least four or five feet in height,

with an open space at one end for carting away the manure. If the bottom is not clayey, it should be laid with, and paved above, either with broad flags, or the common paving stones used for streets. The American farmer may find it convenient to lay a floor of thick plank. At the end opposite where the opening is left, a reservoir should be dug, which might either be lined with clay, and built round with stone, or fitted with a wooden cistern made water-tight, into which a pump may be put, for drawing off the moisture daily.

This reservoir should be situated at the most descending, or lowest part of the dunghill, with an opening in the wall immediately opposite to it. The pavement should have a number of channels, of at least five or six inches deep, and the same width, all running diagonally into the main channel, which passes through the centre, and terminates at the opening. These channels should be well paved, and filled with brush-wood before the dung is laid down: by which means they will be kept open, and the moisture find a ready passage to the reservoir.

Every dunghill should be so situated, as to have its longest sides run from east to west, surrounded by a wall, and covered with a roof. The wall on the south side should be of such a height, as to entirely prevent the sun's rays from touching the dung; on the other three sides, however, there is no necessity for its being so high: six feet from the ground will be quite sufficient, and the roof can be supported by pillars.

The advantages attending this sort of dunghill, will appear at first sight. The wall, by confining the dung, will keep it from being scattered about and lost, and will also preserve the sides of the dunghill from being dried and rendered useless by the action of the air. The shed will keep it from being chilled or deprived of its salts, by the rain passing through it. The wall will also prevent the moisture from escaping at the sides, and conduct it to the bottom. The pavement will prevent it from sinking into the earth, and the channels will conduct it to the reservoir; from whence it can be drawn by a pump into a barrel placed in a cart, and either spread immediately upon the field, or mixed with other substances into a compost, or thrown upon the dunghill itself, being the best of all possible ferments.

The quantity of manure may be increased by laying a layer of earth, leaves of trees, or any other suitable substance, on the bottom, and similar layers may be laid throughout the dunghill; the moisture passing through them, the same being returned from the reservoir, will completely saturate them; the entire will undergo a fermentation, and produce a vast quantity of manure —a quantity which can be so increased, that the farm may be kept in a state of constant and profitable productiveness. The

building should, if possible, be so placed, that the urine from the stable, cow-house, &c. would pass by a channel into the reservoir.

Compost.—Sir Humphry Davy informs us, that all vegetable and animal substances are consumed in vegetation; but they can only nourish a plant by affording matter soluble in water, or gaseous substances capable of being absorbed by the plants.—This great principle appears to be confirmed by several of his experiments, and is probably as correct an account of the food of plants, as we are likely to obtain. We know that all dead animal or vegetable matter, if sufficiently divided, spontaneously undergoes a process, which brings it at length to be a fat, greasy earth, which we call rich loam, or garden mould. The woody fibre of vegetables is longer in undergoing this process, but its texture is at last broken down, and it is resolved into new elements. Animals' matter, therefore, and the mucilaginous parts of vegetables, being more liable to decompose than dry woody fibre, their mixture is evidently required by their nature, and hence the origin and necessity of compost heaps.

With regard to the fermentation of compost heaps, by attending to the foregoing principles we learn, that whenever they are composed of substances easily soluble in water, or easily disengaging their gases or vapours, their fermentation or putrifaction should be prevented as much as possible; and on the contrary, when they consist of woody fibre and insoluble substances, such matters should be added to them as tend to promote fermentation. By attending to this simple principle, the farmer will be at no loss to prepare and manage his manure, so as to make it most extensively useful.

A bountiful Providence has placed every where, substances which form a manure for the soil; but man must not expect to sit still, and that manna will drop into his mouth. His faculties and reason were given him for exertion; and materials are placed within his reach, to enable him, by the exercise of those faculties, to improve his condition.

In the first place, then, let every farmer mark out a small spot, from 20 to 40 feet square, according to the size of his farm; this spot should be dug down from two to four feet deep, and the earth should form a bank round it. A few stout oak posts, with crotches, should be placed in a line along the middle of this pit, and shorter ones should be placed at the sides, to receive strong poles, on which to erect a shed of common boards. Having thus cheaply made a shelter for your manure, which at once secures it from the sun, from rain, and from water running into it, while by removing a few of the boards you can admit them when

necessary, the next step is to bring to it a quantity of top earth, or sods, and if your land be stiff, a quantity of sand. These substances should be mixed, and a layer of about one foot in thickness should be spread over the bottom of the pit; then cut down and collect all the weeds (before they seed) about your fences and farm, and spread a layer of them, of the same thickness, over the former one; then collect dead leaves, by scraping the surface of the adjacent woods, and spread another layer of them; sprinkle this last layer with all the ashes and soot you can collect about the farm; next go to your stable and cattle yard—collect all the animal manure they contain, and add another layer of this; over this spread a layer of bad fodder, waste straw, sweepings of your yard (particularly after rain), and any kind of rubbish about your buildings. You will find that your compost heap will now be raised about five feet; but as this will probably settle, as decomposition takes place, to about three feet, you must begin again with your layers, and proceed till your pit is filled up. Should your soil be very stiff, it will be advisable to sprinkle two or three inches of sand or gravel between each layer, as one great recommendation of this plan is, that you may suit your manure to the nature of your soil. Should it, on the contrary, be light, sandy, and porous, a layer of loamy clay should be occasionally introduced.

This mode of making compost manure, requires but one part out of five of stable manure, to create a fermentation through the whole mass. Should it not speedily commence, you have only to remove some of the boards during the first rain, and the moisture and the heat will soon produce the desired effect. All the materials for the compost heap should be placed in readiness round the pit before you commence, as perhaps it may be advisable to mix the substances a little together, and not let them lie in such detached layers. Should the heap become very hot, the quality of your compost will be injured, unless you open the mass in dry weather. A very valuable addition to a compost heap, is pond or creek mud, where it can be obtained, together with the deposites of leaves and other trash found in lagoons.

It is presumed, as a matter of course, that every one who calls himself a farmer, carefully saves all the dung from his stock of every kind; to increase this, your horses' stalls, and the sheds or yards of your cattle and sheep, should be kept constantly littered either with corn stalks, refuse straw or fodder, dried leaves, or shavings. This will both increase and preserve your stable manure. The materials for the compost heap may be,—sand or gravel, sods or top earth from lanes and hollows, green weeds of all kinds, dried weeds and leaves, ashes and soot, sweepings of yards and all kinds of rubbish, sawdust from mills,

creek mud and pond trash, rotten wood and bark, tanners' bark and offal, and house and kitchen offal of all kinds.

Let not the farmer be misled by the opinion, that these necessary operations will consume too much of his time: let him seriously set himself to work in hauling materials to his manure pit, and he will himself be surprised to find, how easily and how soon compost is made, when he has a little stable manure beforehand.

It is believed that one man and a boy, with a horse and cart, will, in less than one week, create a heap of compost sufficient for five acres of land. It will be recollected, also, that the greater part of this work can be performed at leisure times.

In mixing your compost, the manure from your sheep yard and poultry houses must not be forgotten; and as these are of a hot and fermenting nature, they should be spread over those layers least likely to decompose without their assistance. From six to ten or twelve weeks is sufficient, with proper management, to reduce the compost heap to a condition fit for application; and on emptying your manure pile, care should be taken to turn and mix the heap as much as possible.

Ploughing in Green Crops.—A means of supplying vegetable manure, not sufficiently practised, is that of providing full succulent crops of green vegetables, as clover, buckwheat, tares, vetches, spurry, beans, turnips, and many other similar plants, to be turned down by the plough, in order that they may undergo the putrifactive process under the ground, and by that means be converted into manure, and supply the food for plants. In this practice it is suggested as probable by a late writer, that great advantages might be obtained, on the principles we have just stated, by spreading a small portion of lime and peat, or rich vegetable earth, over such crops, and then rolling them down, that they may be completely turned in and buried by the plough, —an operation which should be performed as quickly as possible afterwards, and where the crops will admit of it, in the Summer or early part of Autumn, while the sun has the power of promoting the decay of such vegetable matters. By this means it seems probable that the putrifaction of such crops would not only be much expedited, but the principles thereby set at liberty be capable of exerting their influence much more extensively than where the plants themselves only are employed; and little additional expense would be incurred by the farmer in executing the work.

Where crops of this nature are turned down in sufficiently hot weather, to insure their running speedily into a putrid state, it is considered by some as a better and more advantageous practice, especially where manures of other kinds are scarce, than that of

obtaining the manure by the feeding or soiling of cattle, which under other circumstances is certainly an excellent mode, and one which should never be lost sight of by the farmer.

LIME.—Lime as a manure has been hitherto but little used in this country. It has lately been introduced into the state of Pennsylvania; and it would appear from the following account given by Mr. Darlington, of West Chester, with some success.

Lime, says Mr. Darlington, undoubtedly has a good effect in soils which are *sandy*,—even where sand predominates; but its meliorating properties are most conspicuous in a *clay* soil,—or rather in a *stiff loam*. A good proportion of decomposed vegetable matter adds greatly to the beneficial effects of lime; and hence our farmers are desirous to mingle as much barn yard manure as possible with their lime dressings,—and to get their fields into what is called a good sod, or turf,—full of grass roots. *Then* a dressing of lime has an admirable effect. The yard manure is not usually mingled with the lime, when the latter is first applied. The practice is, to lime the *Indian Corn* ground prior to planting that grain on the inverted sod,—and, the ensuing Spring, to manure the same field for a *barley* crop;—or, to reserve the manure until the succeeding Autumn, and apply it to the *wheat* crop. It is not well settled which of these is the better practice. Each has its advocates; but it is most usual to reserve the manure for the wheat. The soils indicated by a natural growth of black oak, walnut, and poplar—and those in which such grasses as the *poas* and *fustucas* best flourish, are generally most signallly benefited by the use of lime. In short, I may observe, that lime has been found more or less beneficial in every description of soil, in this district. It is most so, on hilly, or rolling lands, where clay predominate,—less permanently so, among the mica slate;—and least of all, on the magnesian rocks. The soil on these last is rarely worth cultivating.

Quantity per acre. The quantity of lime, per acre, which can be used advantageously, varies with the condition and original character of the soil. Highly improved land will bear a heavier dressing than poor land. On a soil of medium condition, the usual dressing is 40 to 50 bushels per acre. A deep, rich soil, or limestone land in the great valley, will receive 70 to 80 (and even 100) bushels to the acre, with advantage. On very poor land, 20 to 30 bushels per acre, is deemed most advantageous to commence with. It is usually *repeated* every five or six years—that is, every time the field comes in turn to be broken up with the plough; and as the land improves, the quantity of lime is increased. The prevailing practice here, is, to plough down the sod, or *lay*, in the Fall or early in the Spring, harrow it once, and

then spread the lime (previously slaked to a powder) preparatory to planting the field with Indian corn. Every field, in rotation, receives this kind of dressing: and as our farms are mostly divided into about half a dozen fields, the dressing of course comes once in six years, more or less according to the number of the fields. Some enterprising farmers, however, give their fields an *intermediate* dressing, *on the sod*, after they come into grass; which is considered an excellent practice,—tending rapidly to improve the condition of the land.

Manner of applying. The lime is usually obtained in a caustic state from the kiln, deposited in heaps in the field where it is to be spread, and water sufficient to slake it to a powder, is then thrown upon it. As soon as slaked, it is loaded into carts, and men with shovels distribute it as equably as possible over the ground. It is generally considered best to put it on the ground whilst it is fresh, or *warm*, as the phrase is; and it is certainly easier to spread it equally, while in a light pulverised state, than after it gets much wet with rains.

The crop to which it is usually applied, is *Indian Corn*, in the Spring of the year—say the month of April. Occasionally it is applied preparatory to sowing wheat, in Autumn. When used as a *top dressing*, on the sod, it is generally applied in the Fall—say November. The prevailing impression is, that it is most advantageously applied to the Indian corn crop; and hence the general practice. But the truth is, it is highly advantageous at any, and at all seasons.

After the sod is ploughed down for Indian corn, it is usually harrowed once, to render the surface more uniform. The lime is spread as equally as possible over the field,—and then the ground is well harrowed in different directions, in order to incorporate the lime with the soil. Soon afterwards, the field is marked out, and planted with corn. The plough is rarely, if ever used, for the purpose alluded to. It has been mentioned above, that lime is occasionally used as a top dressing for grass. It appears to be particularly beneficial to that crop; and answers extremely well, when applied in that manner. The practice of applying it to Indian corn, as above related, is, however, chiefly followed: and the application of a dressing to each field, in rotation, causes as much labor and expense every year, as our farmers generally are willing to incur. Lime has rarely been used as a top dressing to *grain* crops, so far as is known.

Cost. Quick lime, at the kilns, usually costs twelve and a half cents per bushel. The farmers generally haul it with their own teams; and the additional expense depends, of course, materially upon the *distance*. It is frequently hauled by them a distance of 8, 10, and even 12 miles. The average, perhaps, is

about 5 or 6 miles. It is delivered to me by the lime burners, (a distance of near 6 miles,) at 18 cents per bushel. At the rate of 40 bushels to the acre, the cost, at 18 cents, would be $7,20 cts. per acre. It is difficult to estimate, with precision, the relative profits, in increased products: but it may safely be said, that on a small farm of middling quality, two dressings of lime at the above rate, in the course of 8 or 9 years, will more than treble the products of the land to which it is applied, both in grain and grass. It may also be observed generally, that the farmers of this district, (who are shrewd economists,) are so well convinced of the beneficial effects of liming, that, costly as its application seems to be, they are unanimous in sparing no effort to procure it. Lime has been found to be peculiarly favorable to the growth of pasture, when the farm is otherwise well managed; and as the farmers here are mostly in the practice of feeding cattle, they resort to liming as an indispensible auxiliary to successful grazing.

It has been already intimated that vegetable matters, and especially yard manures, are highly important in conjunction with lime. Both are valuable, even when used separately; but when *combined*, the effect is most complete. If to this be added, the great secret of good farming, *viz.* to plough only so much ground as can be well manured,—the state of agriculture may be considered nearly perfect.

Lime is, in some instances, added to earthy composts, preparatory to distribution on the fields: but it is doubtful whether the extra labor of this method is compensated by any peculiar advantages. It is not generally practised.

There is no soil in this district, deemed worthy of cultivation, on which lime is *wholly* inoperative as a fertiliser. On some sterile, slaty ridges, and on magnesian rocks, it has indeed but a slight effect; and even the benefits of barn yard manure are very transient. In low, swampy grounds, also, unless they are previously well drained, the labor of applying lime is pretty much thrown away. There seems to be something in the constitution of magnesian rocks peculiarly unfriendly to the growth of the more valuable plants. Indeed, there are patches of the soil perfectly destitute of all vegetation. Repeated attempts have been made to cultivate the bases of our serpentine banks; but neither lime, nor manure, will enable the farmer to obtain more than a light crop of small grain. Neither clover nor the valuable grasses, can be induced to take root and flourish in the ungenial soil. It is, therefore, almost universally neglected.

Loudon's Encyclopedia, now, confessedly, the first agricultural work published in Great Britain, contains the following:

General principles for applying lime. The solution of the ques-

tion whether quick-lime ought to be applied to a soil, depends upon the quantity of inert vegetable matter that it contains. The solution of the question whether marl, mild lime, or powdered limestone ought to be applied, depends upon the quantity of calcareous matter already in the soil. All soils are improved by mild lime, and ultimately by quick, which do not effervesce with acids, and sands more than clays. When a soil, deficient in calcareous matter, contains more soluble vegetable manure, the application of quick-lime should always be avoided, as it either tends to decompose the soluble matters by uniting to their carbon and oxygen so as to become mild lime, or it combines with the soluble matters and forms compounds having less attraction for water than the pure vegetable substance. The case is the same with respect to most animal manures, but the operation of the lime is different in different cases, and depends upon the nature of the animal matter. Lime forms a kind of insoluble soap with oily matters, and then gradually decomposes them by separating from them oxygen and carbon. It combines likewise with the animal acids, and probably assists their decomposition by abstracting carbonaceous matter from them combined with oxygen; and consequently must render them less nutritive. It tends to diminish, likewise, the nutritive powers of albumen from the same causes; and always destroys, to a certain extent, the efficacy of animal manure, either by combining with certain of their elements, or by giving to them new arrangements. Lime should never be applied with animal manures, unless they are too rich, or for the purpose of preventing noxious effluvia. It is injurious when mixed with any common dung, and tends to render the attractive matter insoluble. According to Chaptal, lime forms insoluble composts with almost all animal or vegetable substances that are soft, and thus destroys their fermentative properties. Such compounds, however, exposed to the continued action of the air, alter in course of time: the lime becomes carbonate, the animal or vegetable decomposes by degrees, and furnish new products as vegetable nourishment. In this view, lime presents two great advantages for the nutrition of plants: the first, that of disposing of certain insoluble bodies to form soluble compounds; the second, that of prolonging the action and nutritive qualities of substances, beyond the term which they would retain them if they were not made to enter into combination with lime. Thus the nutritive qualities of blood, as it exists in the compound of lime and blood, known as sugar bakers' scum, is moderated, prolonged, and given out by degrees. Blood alone, applied directly to the roots of plants, will destroy them, with few or no exceptions.

Lime promotes fermentation. In those cases in which ferment-

ation is useful to produce nutriment from vegetable substances, lime is always efficacious. Some moist tanner's spent bark was mixed with one-fifth of its weight of quick-lime, and suffered to remain together in a close vessel for three months; the lime had become coloured, and was effervescent: when water was poured upon the mixture, it gained a tint of fawn coloor, and by evaporation furnished a fawn coloured powder, which must have consisted of lime united to vegetable matter, for it burnt when strongly heated, and left a residuum of mild lime.

Bone Manure.—A recent English publication gives the following account of the use of bones as a manure. We are not aware that it has been tried to any extent in this country. The Hon. John Lowell, of Massachusetts, on the recommendation of a friend, some time since made an experiment, the success of which, he says, surpassed all his expectations. The manure brought in new grasses, and encouraged and invigorated the old. His mode of application, was, to beat up the bones with a sledge hammer, or with the back of an axe, and then to press them below the surface, with a rammer or beetle. The effects *were much greater* than an *equal quantity* of horse and cow dung. The work alluded to, states, that in several of the northern, as well as some of the midland counties, this excellent manure has been long used, progressively increasing in quantity from year to year, as experience taught its value. It is not a little extraordinary, that in many of the counties in the southern part of the kingdom, the farmers should be so long ignorant of its virtues; but since its introduction into Berkshire and Surrey, about five years ago, with complete success, many who were sceptical, have now become warm advocates for its general use; and ere long, the agriculturists of the counties around the metropolis at least, will be as loud in its praise, as the experienced farmers of Lincolnshire, Yorkshire, and Nottinghamshire.

Of the use and advantages of this manure, we will now proceed to give a brief description, the result of our own experience.

No manure equals it for the turnip crop—Swedish, as well as the other kinds. When land is dressed with bone manure, plants are rarely attacked by that dreadful destroyer of turnips, the fly; and even when subjected to the depredation of that insect, they thrive so rapidly that they generally grow beyond its power of injury. It is almost needless to call to the recollection of the farmer, the fields which he has seen devoured by that voracious insect, as soon as the plant appears. Now by using bones, this evil will scarcely ever occur.

Bone manure is *cheap*, *light of carriage*, and possesses *strength* and *durability*—no slight recommendations.

First, It is *cheap*. An acre of land, however poor and barren, will produce a good crop of turnips by expending sixty shillings in bone manure; and where the land is in good condition, an excellent crop will be obtained by using from thirty to forty shillings' worth.

Secondly, It is *light of carriage*. One wagon will easily convey one hundred and twenty bushels. Let the average of land be estimated as requiring twenty bushels per acre, there will be enough in a wagon load for six acres. With a proper drill, ten or twelve acres can be manured in one day. Here is an immense saving of labour, at a season of the year, too, when so much is to be done by the farmer. If dung were to be had for nothing, and happened to be two miles from the field, the cartage alone would cost nearly as much as the whole amount of the bone dressing. But dung is sold in many parts of the kingdom at a high rate, the cost of it swallowing up, not only the turnip crop, but a portion of that crop which follows. Where a large breadth of turnips is sown, and where there is plenty of dung on the farm, how frequently do we see the best part of the season gone before half the turnips are sown. The reason is obvious—the *cartage* of this species of manure has taken up the time.

Let us now consider, thirdly, the *strength and durability* of bone manure. It is strong enough to produce as fine, nay, a superior crop of turnips to that produced by the richest dung: and the crops of the three succeeding years will be quite as good as those following a crop of turnips from rich dung. In making these observations, we beg to be understood as not depreciating the value of dung as a manure. We admit that is of immense importance; but we presume it will be conceded, that few farmers have as much as they wish, and the majority have not half enough. If it be now asked, how these deficiencies of manure are to be supplied? we answer, by bone manure.

It would be a waste of time to enter into the question of carrying dung from large towns to a remote distance; but bone manure, from its lightness of carriage, is not liable to that objection. There is no farm, however remote, that may not partake of its advantages. Even the distance of twenty miles from a navigable river or canal, will not be deemed too great to fetch it, seeing that one team will draw home sufficient to dress six acres of land. To those persons, then, *who have not so much dung as they would like to have*, and to those *who have not half as much*, bone manure will prove inestimable.

The best method of using this dressing, is to drill it in with the seed. It may, however, be sown broad-cast with good effect. If drilled, it is better, when the soil is well pulverised, to let the land remain just as left by the drill, without being harrowed or

rolled. If the manure be used by broadcast, ten or fifteen bushels per acre extra should be sown. Where land is highly cultivated, from ten to fifteen bushels an acre drilled, have been sufficient to produce excellent turnips. If the broad-cast system be practised, the bone manure must be scattered after the land has been ploughed; then let it be harrowed once, and the seed must next be sown. The land must then be harrowed as it may require.

For barley or oats, the bone manure is very good, and particularly fine for Winter or Spring vetches, as well as peas of all kinds; also for wheat. It is still better for rye. With each of these crops, it may either be drilled in with the seed, or sown broad-cast—taking the precautiŏn of using more, should the latter method be practised. The quantity used per acre, according as the soil is more or less fertile, varying from sixteen to forty bushels.

This manure, for the crops above enumerated, is adapted for all soils, except strong clay; but the higher, the drier, and the warmer the soil is, the more will its good effects be manifested, and come quicker into operation.

As a dressing for grass land and young clover, it cannot be equalled. The proper periods for using it are, in the Autumn, or very early in the Spring, taking care to have the grass short, that it may the more readily reach the roots. If used in meadows, the best time is immediately after the hay is cleared off. Fifty bushels an acre on grass land would have a very beneficial effect, even to the tenth year. If a hundred bushels per acre were used on pasture lands, no more manure would be required for twenty years. It has the effect of producing white (Dutch) clover, and other rich herbage, in the greatest abundance, upon which sheep and cattle thrive exceedingly. Worn-out meadows, and gentlemen's parks, even where situated in the poorest soils, will derive an incalculable benefit from its fertilising powers.

It may be advantageously used to be mixed up with any kind of ashes, or very rotten dung—about two-thirds ashes or dung, and one-third bones; after being mixed together, a strong fermentation will take place, which will cause the former to be almost as powerful as the bones. The bones will also decompose, and operate more speedily, than they otherwise would do. The horticulturists and florists, in their respective departments, will find it excellent. No other manure will produce flowers so luxuriantly as this; and from its easiness of carriage, it may be conveyed into the parterre without injuring the walks. In hot and green houses, it will be found of great use. In fact, whether used in the field or garden, it cannot be misapplied.

Concluding Remarks.—*On the management of organic ma-*

nures, depends much of their value as food to plants. The great mass of manures procured by the cultivator, are a mixture of animal and vegetable matters, and the great source of supply is the farm or stable yard. Here the excrementitious matter of horses, cattle, swine, and poultry, is mixed with straw, haulm, chaff, and various kinds of litter. To what degree should this be fermented, before it is applied to the soil? And how can it best be preserved when not immediately wanted?

A slight incipient fermentation is undoubtedly of use in the dunghill; for by means of it, a disposition is brought on in the woody fibre to decay and dissolve, when it is carried to the land, or ploughed in the soil; and woody fibre is always in great excess in the refuse of the farm. Too great a degree of fermentation is, however, very prejudicial to the composite manure in the dunghill: it is better that there should be no fermentation at all before the manure is used, than that it should be carried too far. The excess of fermentation tends to the destruction and dissipation of the most useful part of the manure; and the ultimate results of this process are like those of combustion. It is a common practice amongst farmers to suffer the farm-yard dung to ferment, till the fibrous texture of the vegetable matter is broken down, and till the manure becomes perfectly cold, and so soft as to be easily cut by the spade. Independent of the general theoretical views unfavourable to this practice, founded upon the nature and composition of vegetable substances, there are many arguments and facts, which show that it is prejudicial to the interests of the farmer.

In favour of the application of barn-yard manure in a recent state, a great mass of facts may be found in the writings of scientific agriculturists. Arthur Young, in his *Essay on Manures*, adduces a number of excellent authorities in support of the plan. Many, who doubted, have been lately convinced; and perhaps there is no subject of investigation, in which there is such a union of theoretical and practical evidence.

CHAPTER IV.

IMPLEMENTS OF HUSBANDRY.

The superiority of British husbandry over that of most other nations, may in a great measure be attributed to the numerous valuable implements employed in executing the various processes of agriculture. The number of these implements, however, is so great, and in this country, continual additions are making to the list, that the prudent farmer, in regard to that, as in every other branch of his art, must study economy. We should not incur an unnecessary expense in buying them, nor in purchasing more than are essentially requisite, and can be profitably used. This maxim ought to be more especially attended to by young improvers, who are often tempted, under the specious idea of diminishing labour, and saving expense, to buy a superfluous quantity of implements, which they afterwards find are of little use. Still the importance of proper implements is such, that too great encouragement cannot be given to persons of genius and experience, to devote their time and attention to their improvement, and to the invention of such as may abridge the labour and expense of cultivation.

In purchasing implements, care should always be taken to get such as are simple in their construction, that their uses may be more easily understood, and that any common workman may be able to repair them when they get out of order, and such as are well made, of strong and substantial materials, that the labour may be less liable to interruption from accidents.

The implements necessary to agriculture, are the plough, the harrow, the roller, the threshing machine, corn sheller, and fanning mill, or winnowing machine. But besides these, there are many which will be found very useful to the farmer, both in facilitating and saving labour.

The Plough.—There are several instruments used in husbandry, which, perhaps, might be dispensed with; but land can not be cultivated to any extent, or to much advantage, without the plough. In the formation of ploughs, there is a great differ-

ence, and indeed they vary in almost every country, according to the nature of the soil and other circumstances.

The parts of a plough are *the beam*, or that part which carries the coulter, and furnishes the point of draft; the *head*, is the plane on which it moves; the *soc;* the *mould board;* the *coulter*, a sort of knife inserted in the beam, and so placed before the soc, as to cut the sod; and the *handles*.

Several directions are given for the proper construction of a plough. The best, are considered those of a good length of beam; and which should be as near the point of resistance as possible, and somewhat curved. The angle between the head and the beam may vary, according as it is wished to make a deep or a shallow furrow. The soc should be well pointed and polished. The slope of the mould board is varied with the notion of the workman. The coulter should be set with its lower end slanting forward; and the handles, of some kind of heavy wood, balance the head, the soc, and the mould board.

Much improvement of late years has been made in the construction of ploughs. Wrought and cast iron ones have come into use, and are recommended by many as preferable to those made of common materials.

It is a general opinion, that a heavy plough is more disadvantageous than a light one; because, the draft of the former being greater, will be more fatiguing to the cattle; but the experiments of the Agricultural Society in London, establish a contrary doctrine, and show that in light grounds, the labour is more easily and better performed with a heavy, than with a light plough.

The foregoing is an account of the common plough; but there are different sorts of ploughs in use for various purposes.

The *wheel plough* is said to require less skill in the ploughman; keep a more regular depth, and turn a shallower furrow; to afford assistance to the ploughman in soils of a stubborn, adhesive, or stony quality; but they are more expensive and liable to get out of repair.

By the *trench plough*, two or more slices are taken with the same instrument. The first cuts off the weeds and stubble, and deposits them at the bottom of the furrow; the second slice is turned over the former, and completely covers it.

Double furrow ploughs, are recommended from high authority as saving the attendance of one person, and doing nearly double the work in the same space of time, with little additional strength in the team.

The *side hill plough*, used for working on side hills; and,

The *hand plough*, a very useful implement for garden cultivation.

The Harrow.—This is of different kinds: the triangular and the square, the single and the double. The uses of the harrow are to smooth the field after ploughing, to break and pulverise the clods, and cover the seed. These uses sufficiently indicate the propriety of employing two in succession; one of heavy frame, with few and long teeth, like the Scotch brake, the other, of light make, with more and short teeth. It is thought that the common harrow covers the seed too much, because small seeds will not vegetate at a depth greater than three inches.

The following are the principal rules regarding the formation of harrows: 1st, that not any two of the teeth should move in one track; 2d, that the tracks should be at equal distances from each other; and 3d, that the teeth should either be round, or perhaps with a sharp edge bent forward, like so many coulters, as they make themselves cleaner than when they are square, or of any other shape, and work easier after the horses.

There have been several patented harrows, the last of which we believe, is Mr. Chandler's improved double harrow. This is of a triangular form, consisting of two parts joined in the centre by a pair of hinges, which allows of one part being turned over the other. It has also the advantage, that in its motion over the ground, it readily yields to inequalities.

The Roller.—An intelligent farmer maintains, that if draining is the *first*, manuring the *second*, and cultivation the *third*, that rolling ought to be considered the *fourth* principal operation in the processes of agriculture. Its importance, indeed, is every day becoming more apparent, and new advantages are derived from its use, both on arable and on grass lands.

Its uses are to render loose soils more compact, to break the clods on stiff ones, and on both to compress the earth (after seeding) so that it be every where brought in contact with the grain. It is also usefully employed in reinstating the roots of meadow grasses, loosened and raised by the alternate freezing and thawing of the ground, and with similar views may be passed over winter crops early in the Spring.

The roller is a cylinder of heavy wood, placed in a frame, and turning on an axle, to which is attached a shaft. It is of different dimensions, but need not exceed that which may be drawn by one, or at most by two horses or oxen.

If a wooden roller be surrounded with circles of iron, six inches asunder, two inches broad, and three thick, or if it be studded with iron spikes resembling harrow teeth, and projecting three or four inches, its capacity will be greatly increased.

The increasing importance of this instrument induces us to

give the following from the Northern Farmer, where it appeared in a communication from Mr. Clagget, of Portsmouth.

"To make a roller some take a log, others a stone hewed round. Either is much better than none; but they often drag the small stones, &c. forward, instead of beating the same down perpendicularly into the ground.

"A roller made of old truck or cart wheels is preferable. My men made one of a pair of old truck wheels in the following manner. A two-inch white oak plank was cut into short pieces, one end of each piece resting on the hub, and the other end projecting about half an inch above the felloes by wooden pins. A heavy axletree was then put in, about seven feet in length, the ends projecting out of the hubs about five or six inches. The wheels were next covered with narrow thick pine plank, and spiked into the ends of the white oak plank.—But the planks must be hewed, so as to form a perfect circle, previous to driving the spikes.

"The planks which cover the machine, must not only be very narrow, but thick, the edges being hewn obliquely, being well jointed, resting upon and supporting each other, and therefore capable of resisting a great external pressure. Narrow white oak plank, or small timbers are then to be formed in the shape of an oblong square. In the centre of the sides of this frame, a square hole is cut so the ends of the axletree may enter, and in this frame the roller revolves. To the front end of this frame the tongue or spire is attached, so that the machine may be drawn with horses or oxen. Many farmers now use rollers of a similar construction. Should it be desirable to pick rocks while operating with the machine, it would be easy to construct a box to be attached to the frame. The strength of the roller may be increased, by nailing iron hoops round the outside. I think that large are preferable to small wheels; in order to turn the machine with the cattle with greater ease, it may be judicious to have the circumference in the middle a little larger than at the ends. But when the middle rests upon rising ground, or a little hillock in the act of turning, there is no great difficulty."

HORSE HOE.—This is an implement calculated not only for destroying weeds, but also for pulverising the soil, between the rows of plants set in straight lines, such as turnips, potatoes, or any sorts of grain, that have been sown in drills, at regular distances from each other. At the same time, the hand hoe is necessary for cutting up weeds, and loosening the earth between the plants, which the horse hoe cannot reach.

THE SCARIFIER OR CULTIVATOR.—This is such an efficient

instrument, that no extensive farmer should be without it. If the ground has been recently completely loosened by the plough, it tears up the weeds and brings them to the surface, acting at the same time both as a sort of plough and harrow. The coulters are put either in a square or triangular wooden frame. Such, says Sinclair, is the utility of this implement in saving ploughing, and in keeping the land clear of weeds, that it is supposed to have added considerably to the value of every farm where it has been introduced.

Some improved implements of this kind have been introduced here. Among these are Seaver's; also Howard's fixed and expanding cultivators. The power of dimishing and increasing the width of the implement, must be a very convenient improvement.

The use of pronged implements as substitutes for the plough, says the Encyclopædia of Agriculture, is comparatively a recent invention. They differ from the plough, in stirring the soil without reversing its surface, or altering its form, unless, indeed, they in some cases tend to even or level inequalities; they act both as the plough and harrow at the same time, and on suitable soils, and at proper seasons, much more labor is effected with less expense of men and cattle. Wherever, therefore, lands require to be stirred for any purpose, excepting that of reversing the surface or laying them into beds or ridges, recourse may be had to pronged tillage implements.

The Corn Sheller.—This is one of the most valuable labour saving machines now in use. Various machines for the purpose of shelling corn, have been introduced to the notice of the farmer. But that which seems now to claim the superiority, is Harrison's. The wheel of this machine is vertical, and is turned with a crank by a single person. The employment of two hands, a man and a boy, one to turn, and the other to supply it with ears, makes it however, a much faster worker. It is calculated to shell from ten to twelve bushels of corn per hour.

Threshing Machine.—Within a few years these instruments have come into use in different parts of the country, and they have in a great measure superseded the old mode of threshing by the flail or with horses. They have their advantages and their disadvantages, but are upon the whole useful instruments. A writer in one of our agricultural periodicals, says, I have seen tried a variety of different kinds, but the farmers here have settled down to the use of two kinds—one invented here, and called "the Vosburgh machine," for which a patent has never been obtained, but is nevertheless a good machine—and the other is "Allen's patent threshing machine." Vosburgh's is a cylinder,

working horizontally over a concave, and in both are teeth; the horse power is fixed and permanent. Allen's is likewise a cylinder and concave, and both are likewise armed with teeth. The teeth are so set that in the turning of the cylinder, they pass between those in the concave, and the straw with the grain in, is shoved in between them and carried through by the motion of the cylinder; the grain is thus separated from the straw. The cylinder is much smaller than Vosburgh's—the horse power is differently constructed and portable, so that the machine, when in use, is only slightly fastened to the barn floor. It may, together with the horse power, be carried from barn to barn. The cost of a machine requiring the power of two horses to use it, is from $70 to $80, finished and complete for threshing. For those requiring one horse power, the price is less, and for those requiring the strength of three horses, the price is proportionably increased.

Fanning Mill.—The fanning mill or winnowing machine, is well known to every farmer. By these machines, with the aid of riddles attached to them, all dirt, seeds of weeds, chaff, and other refuse, are separated or blown away. In consequence, the grain is more easily preserved, and, when manufactured into flour, yields the best and the largest quantity.

The Straw Cutter—Is now added to the list of implements highly useful to the farmer. Since the practice has been introduced of feeding the coarser food, such as cut hay, straw, corn tops, &c. to cattle, the hay and straw cutter will be considered almost a necessary implement. There are a variety of these machines, now employed in different parts of the country, each having its advocates. The instrument itself is undoubtedly useful. We mention Eastman's as being equal, if not superior to any. In addition, there are Willis's vertical straw and hay cutter; Safford's improved and common straw cutter; and the common Dutch hand-cutting machine.

Flax-Dressing Machine. In the year 1823, a committee of the directors of the Pennsylvania Agricultural Society, attended a trial of Goodsell's patent hemp and flax-dresser and grain-thresher. In a letter addressed to the President of the Society, the Corresponding Secretary states:—"The total failure of the various machines which have been brought into view, to effect the objects which Mr. Goodsell's ingenious and simple contrivance has completely accomplished, had produced evident doubt in most of us. Yet after the experiment, we are all convinced,

that he has placed within our reach, the valuable implement, for which premiums had been offered in vain."

It is stated, that in some parts of this state, machines impelled by water have been erected, for breaking and dressing flax, and that they fully answer the purpose.

MISCELLANEOUS IMPLEMENTS.—As we before mentioned, agricultural labour-saving implements, are continually adding to the list. Among which we find, machines for sowing broadcast; hand seed-sowing machines; Willis's hand-sower and corn-planter; revolving horse-rakes, &c.—all which are presented to the agriculturist, for his reception or rejection, as he shall determine them to be useful or otherwise. With regard to the latter, revolving horse-rakes, we are informed, that they are in very general use in New-Jersey, and Pennsylvania, where they are much approved. One man and horse, will rake upon an average, five acres a day, with ease, and do the work well.

CHAPTER V.

CULTIVATION.

THE various benefits arising from good tillage, cannot be too much inculcated. By tillage, both the composition and consistence of the soil are improved, and adapted to the nature of the different species of cultivated plants. By its assistance, the manure and the seed are most advantageously deposited. It is calculated to give considerable relief from surface water, and undue moisture, by enabling the cultivator to extend the depth and adjust the surface of the soil. It can be employed to destroy almost all the varieties of weeds which lurk in the soil, either as roots, or as seeds, bringing the former to the surface, and inducing the latter to vegetate. By the same means various tribes of insects, and their larvæ, (more especially if the ploughing is given before frost), is got rid of. And by exposing the soil to the influence of the atmosphere, the decomposition of dead substances, and at the same time, the growth of living plants, are promoted. As all these important advantages are to be obtained by the operations of tillage, it is not to be wondered at, that skilful and experienced husbandmen, have in all ages and countries, entertained the highest ideas of its utility.

PLOUGHING.—The depth which land should be ploughed, must in some measure be regulated by the deepness of the soil. On thin soils, more especially on a rocky substratum, the ploughing must necessarily be shallow; but when the soil, whether light or strong, will admit of it, a furrow ought to be given as deep as a pair of horses can accomplish; and it is occasionally advantageous upon almost every soil. *Tap-rooted* plants require deeper tillage than others: *Fall ploughings* may be deeper than those of *Spring*, and *Spring* than those of *Summer*. If the vegetable soil be deep, deep ploughing will not injure it; but if it be shallow, such ploughings will bring up part of the *sub-soil*, which is always *infertile, until it receive new principles from the atmosphere*." "They who pretend," says Arthur Young, "that the under layer of earth is as

proper for vegetation as the upper, maintain a paradox, refuted both by reason and experience."

Where, however, it becomes part of your object to increase the depth of the surface soil, deep ploughing is indispensable; and in this, as in many other cases, we must submit to present inconvenience for the advantage of future benefit.—But even here, it is laid down as a rule, that "*in proportion as you deepen your ploughings, you increase the necessity for manures.*"

From six to eight inches, may be taken as the ordinary depth of sufficient ploughing.

Time of ploughing. The more scientific opinion is in favor of *Fall* ploughing; because to the action of air and moisture, it adds that of *frost*, whose sceptic or dividing quality is second only to that of the plough itself. In clay soils, this preparation should never be omitted: because on those the action of frost is greater, and because one ploughing of *this* kind may save two in the *Spring*, when time is every thing. In this operation, however, we must not forget to *ridge*, as well as *plough*; and care must be taken, that our furrows have sufficient declination to carry off surplus water. With these precautions, your clay ground will be ready early in the Spring for another ploughing; and the decomposition of the sod and weeds, (turned down in the Fall) will be nearly if not altogether complete.

In dry and warm soils, these advantages are less; but still, the time gained for Spring work is a sufficient inducement to a practice that economises, not merely our labor, but the productive powers of the earth also, by soonest enabling us to shade the soil with a growing crop. In very dry, light lands, ploughing should be carried on in damp weather, particularly the last. On the other hand, soils of so retentive a nature as to hold water, much more in quantity than is useful to vegetation, ought to be ploughed in a medium state. neither wet nor dry. When perfectly dry, they will not plough at all, being so hard and tenacious; and if ploughed when wet, the land is ruined by packing and plastering; hard clods are formed, which it is very difficult afterwards to reduce, and a whole crop may consequently be lost.

Mode of ploughing. The question with regard to *level* or *ridge* ploughing, does not seem to admit of any satisfactory answer. Stiff, heavy, wet clays, and perhaps, all ground in which clay predominates, whatever be the culture, should be made to take the *ridge form;* because, it powerfully tends to drain the soil and carry off from the roots of the growing plants, that superfluous water which, left to itself, would seriously affect both the quality and the quantity of their products. In sandy, porous, dry soils, on the other hand, *level* ploughing is to be preferred, because ridging such soils would but increase that want of cohesion, which is their natural defect.

A *loamy soil* (which is a medium between these two extremes), ought, in a dry climate, to be cultivated in the *flat* way, that it may the better retain moisture; and in a wet climate, in *ridges*, that it may the sooner become dry.

HARROWING.—This process is of essential use in the culture of arable lands. By harrowing, the soil is pulverised; root-weeds near the surface, are torn out and collected; the manure that has been inserted in the soil, is more thoroughly mixed with it; and the seed is more effectually covered.

Harrowing is given in different directions; first in length; then across; and finally, in length as at first.

The work should be performed on wet ground, in a dry time, and in the middle of the day. On dry lands, it is best to harrow in the morning, while the dew is on, and when the ground is moderately dry.

ROLLING.—In preparing every species of adhesive soil for a Spring or Summer crop, in particular, when barley, potatoes, or turnips, are to be sown, rolling is essential; but it is after the seed has been sown, that the greatest advantages are derived from the process.

Wheat should always be rolled in the Spring after frosts. When any crop of grain is sown with artificial grasses, rolling is particularly necessary, to make an even surface. Oats in a light soil, turnips sown in drills, and flax, ought to be rolled immediately after sowing.

Rolling is executed to most advantage, across the direction of the ridges, because more adapted to insure full benefit to the furrows, which otherwise may not be properly gone over.

CHAPTER VI.

CULTIVATION OF GRASSES.

In the modern and improved system of husbandry, the cultivation of a farm may be considered under two heads; the *grass* and the *arable* land.

The convertible system of husbandry, is where land is converted from tillage to grass, and then again from grass to tillage, and so on, alternately. The advantages to be derived from this practice, says a writer of authority, (Sinclair,) cannot be too much dwelt on. By the grain crops, a sufficient quantity of straw is provided, partly to be used as food, but principally to be employed as litter for cattle, while at the same time, a fair profit is to be derived from the grain. By the grass and green crops, a number of domesticated animals are maintained both in Summer and Winter; and when they are abundantly littered, as well as fed, a regular and sufficient supply of valuable manure is secured. Hence it is that alternate crops for the food of man, and of the inferior animals, is in general, indispensable for the profitable production of both corn, and of animal food, on all soils susceptible of cultivation.

On the subject of cultivating the grasses, we shall take for our guide, an authority, we have before acknowledged.

Judge Buel has given a classification of the grasses, the seeds of which can be procured in this country, and pointed out the soils on which they respectively thrive. He divides them as follows:

I. Grasses best suited to arable lands, and designed to alternate with grain and roots.

II. Those best adapted for hay or meadows; and

III. Grasses which are most profitably sown for perennial pastures.

I. There are several descriptions of land, which are much more profitably employed in tillage than in grass, particularly those that are dry or light, and which have little tendency to produce good herbage. Yet constant cropping with grain would

soon exhaust them of fertility, without an expense for manure which few can afford. The system of introducing artificial or sown grasses, after two, three, or four years' tillage, is happily calculated to avert the evil, and constitute the basis of most of the late improvements in arable husbandry, as well as farm stock.

The grasses best calculated for this purpose, are red and white clovers, lucern, sanfoin and the orchard, tall oat, timothy, and rye grasses.

Clover is the primary dependence on all soils which will grow it, and particularly where gypsum can exercise its powers. As vegetables are said to exhaust the soil in proportion to the smallness of their leaves, clovers are entitled to the high commendation they have obtained among American farmers. But as these plants are liable to premature destruction by the frosts of winter, it is prudent and wise to intermix with their seeds, those of some other grass more to be depended on.

On *sands*, *light loams*, and *gravels*, (and these constitute the soils usually employed in convertible husbandry), the orchard grass, or tall meadow oat grass, appears best calculated for this purpose. They grow early, delight in a clover soil, and are fit for the scythe when clover is in bloom, the period at which it ought to be made into hay. The hay from this mixture, may be made before the harvest commences; and if the soil is good, a second crop may be cut almost equal to the first. If extended for pasture the second or third year, either of these grasses will afford more abundant herbage than timothy. Lucern may be sown on deep sand loams; and sanfoin on dry soils, naturally calcareous, or on those which have been rendered so by marle or lime.

On *clays*, and *heavy loams*, timothy may be sown alone, or those grasses named in the preceding paragraph, separate or mixed.

On *wet soils*, and reclaimed swamps, as the only object of tillage *ought to be* to prepare the ground to be laid down in grass, the kinds indicated in the preceding remarks as suitable for such soils, and intended for meadow grasses, should be selected; yet so scanty is our assortment, that we can only name timothy and herdsgrass.

II. MEADOWS.—These may be classed under three heads, viz. low, or alluvial lands, on the banks of rivers, creeks, and brooks; uplands, naturally moist, or of clay, or heavy loam; and reclaimed bogs and swamps. These soils, to adopt a common term, are *natural to grasses*, while the expense of tillage, and the uncertainty of a crop, render it most proper to appropriate them to grass. The objects in stocking meadows, are, to select those grasses

which *yield the greatest burthen of hay*, and *afford the most nutriment for cattle.*

When mixed seeds are employed, care should be taken to select those which can be most profitably cut at the same time. The impropriety of mixing timothy and orchard grass, for instance, will be apparent, from observing that the last should be cut in the latter end of June, while the former continues to improve till the last of July.

Timothy is undoubtedly the best grass which can be employed for meadows, on moist or tenacious soils. Herdsgrass and rough stalked meadow grass, often come in spontaneously. And if the timothy is left standing until it is ripe, seeds enough fall to supply new plants.

For *light loams*, *sands*, and *gravels*, the tall oat and orchard grasses are probably the best, and to these may be added, red and white clover.

The great difficulty is, to prevent the deterioration of meadows. This takes place from the better grasses running out, and giving place to coarser kinds, to moss, and to useless and noxious plants; aided often by a neglect to keep them well drained. The finer and more nutritious kinds thrive well in *moist*, though but few will live in *wet* soils. It is therefore of the first importance, to keep the surface soil free from standing water, by good and sufficient drains; and it often becomes necessary to lay the land in narrow ridges, at right angles with the ditches. Another precaution to be observed is, not to depasture them with heavy cattle when the ground is wet and poachy.

Harrowing in the Fall, has been found beneficial to meadows. In Europe, top dressings of lime, marl, compost, ashes, and yard manure, are repeated at intervals of two or three years. With us, the annual application of a bushel of plaster of Paris, is found beneficial on most lands not absolutely wet. Stable manure should be applied only when it can be spared from the more profitable uses of tillage, and is far more beneficial mixed with the soil, than spread upon its surface. Its most economical application is in the form of compost, made by mixing it with bog earth, river sand, the wash from the highways, or other rich earth, at the rate of one load of dung to five or six of earth. If turned and mixed well, this constitutes a valuable top-dressing for grass grounds, and is best applied in the Autumn. When these means fail to insure a good crop of hay, it is time to resort to the plough, a course of crops, and re-seeding.

III. Pastures.—Here the object is to obtain those grasses that are nutritious, relished by cattle, and which supply green

feed from March to December, or such a mixture as will give a succession of fresh herbage during the grazing season.

The tall oat, rye, and orchard grasses, are best adapted to the lighter and drier soils, where the spontaneous growth of clovers and other indigenous grasses, should be encouraged by top dressings, or the application of plaster. In moist and stiff grounds, timothy and herdsgrass may be sown with the tall oat.

The observations under the preceding head, in regard to draining, top-dressing, sowing seed, and harrowing, lose none of their force when applied to pasture grounds. It is believed that if once introduced upon our farms, the valuable grasses which we want, would propagate themselves.

The number of grasses is very great. It is said that 215 properly so called, are capable of being cultivated in Great Britain. Judge Buel has given an account of twenty-five, foreign and domestic, and exhibited in a tabular view their comparative value, as indicated by their product, and the quantity of nutritive matter which they severally afford, together with the time of their flowering and seeding. For particulars, the reader is referred to the paper in the third volume of the Memoirs of the Board of Agriculture.

Another paper in the Memoirs, by S. De Witt, Esq., says: In laying down grounds for pasture lands, the English select the seeds of such grasses as will come to maturity in succession; but I think they carry this scheme to excess, and that there is no necessity for a mixture of such a variety of seeds, to be used for these purposes. In our country, the most esteemed grasses are, white and red clover, timothy, or herdsgrass, the red top, and foul meadow. With these some other indigenous grasses intermix, the merits of which deserve to be investigated. Our best grasses for meadows, are unquestionably the timothy, the red top, and the foul meadow. The merits of this last are not generally known. There can be no better hay than that which is made from it. On a rich, moist soil, it will grow uncommonly dense, and I should think, would yield as much from an acre, as any other of the best cultivated grasses.

Sowing Grass Seed.—By the experience of English farmers, continues the same writer, we are taught, that in order to have good *pastures* and *meadows*, no pains or expense must be spared, to enrich the soil where that is needed, to destroy as far as possible, by a suitable course of husbandry, every weed and plant that previously occupied the field, to have the ground perfectly pulverised by ploughing and harrowing, and then to sow on it a plentiful quantity of grass seeds suited to the soil, and of those kinds which have been proved to be the best for those purposes.

The practice of putting a small quantity of grass seed on ground laid down for pastures or meadows, is one of the greatest errors in the husbandry of our country. Every body knows what a small quantity is generally used, and how long it is before lands laid down as pastures or meadows come to perfection, and how they are injured by grasses of spontaneous growth, which ought not to be there; but for which the greater part of the surface of the ground is left by the stingy sower.

Quantity of seed to be sown.—On this subject there is a great diversity of opinion among the writers in our different periodicals. As a sample of the practice adopted in England, the writer last referred to quotes from a book published in that country, and wishes our farmers generally could consult it. It gives recipes for the kinds and quantities of seed per acre, proper to be sown on all the varieties of soils, such as *clay*, *loam*, *sand*, *chalk*, *peat*, *uplands*, *midlands*, and *lowlands*.

In the recipes for the various soils, the quantity of seed is generally about a bushel per acre. Much larger quantities, however, are sometimes sown with advantage.

The following proportions were sown a few years since, by the Earl of Darlington:

White, or Dutch clover - - - - -	17 lbs.
Clear hay seed - - - - - -	14 bushels.
Rib grass } Trefoil } - - - - - -	1 1-2 lbs.

By which means (the soil being previously ploughed very fine, and made perfectly level,) the land was speedily covered with a thick and excellent herbage. This was certainly very heavy sowing.

Mr. Dalton's mode of laying down land to grass, is, to make the ground perfectly smooth and level, and then sow upon every acre the following seeds, viz.:

Hay seed - - - - - -	6 bushels.
Rib grass - - - - - - - -	12 lbs.
White, or Dutch clover - - - -	8 do.
Burnet - - - - - - - -	5 do.

In the laying down of land for the purpose of forming a good meadow, greatly superior to the generality of pastures, the late Mr. Curtis recommends certain grasses, and two species of clover, to be mixed in due proportions. We do not give these proportions: the object is to introduce the concluding passage, viz. "These are to be mixed together, and about *three bushels* of them sown on an acre."

Such appears to be the practice where agriculture has been growing towards perfection, aided by all the efforts of man, and the acquisitions of science and experience, assiduously and con-

stantly applied for its melioration, for more than a thousand years.

Manner of sowing.—The manner of sowing the grass seed, also requires to be particularly attended to. It is a bad practice, says the Code of Agriculture, to mix seeds of different plants before sowing them, in order to have the fewer casts. It is better to sow each sort separately, for the expence of going several times over the ground, is nothing compared to the benefit of having each sort equally distributed. The seeds of grasses being so light, ought never to be sown on a windy day, an equal delivery being a point of great consequence. Wet weather ought likewise to be avoided, as the least degree of poaching is injurious. Grass seeds ought to be well harrowed, according to the nature of the soil.

Time of sowing.—There seems to be some diversity of opinion, with regard to the *time* when grass seed should be sown. The following, we think, judicious remarks on this subject, connected with the question whether they should be sown alone, or with grain, are from a writer in the New England Farmer.

The sowing of grass seeds in Spring, may take place, either with, or without grain; if they are sown with grain, the young grass will suffer greatly by the interference of the roots, and of the straw of the grain. The roots will rob it of a great portion of its nutriment, and the straw will deprive it in a great measure, of the benefit of the atmosphere, air, sun, dews, and rain. Grain and grass thus striving together, are drawn up faster and slimmer than they would be, if sown separate and alone. This forced growth injures the roots of the grass, which at the time the grain is mowed, is left exposed, weak, and exhausted, to the ardent heat of the sun, deprived on a sudden of the shade, which before was forced on it by the grain. Upon new lands, or upon such as are richly manured, these injuries may not, perhaps, in common years, prove destructive, but upon our old fields, the chance is truly a deplorable one.

I consider the method of sowing grass with grain, to be the worst, in this climate, especially if sown with oats, which of all grains used with us for that purpose, are the most exhausting and overpowering. It is evident that in the contest between grain and grass, when sown together, although grain is always triumphant in the main point, which is life, yet the quality of the produce suffers greatly. The roots of the grain are obstructed by those of the grass, and the soil being more or less covered and clothed by the grass, the roots of the grain are deprived of the fulness of the benefit of air and heat, dews and rains, which otherwise they would have enjoyed.

We conclude therefore, from this exposition, that the result of

sowing grain and grass together, is to injure both crops, and very often to lose the grass entirely. Such loss and vexation may be avoided by sowing the grain alone, early in the Spring, with such manure as has been allotted for the field; and as soon as possible in August, after the crop of grain has been housed, to plough the stubble in, turning a good furrow, that the stubble may have a chance of mouldering away, which the showers usually taking place about that time, and the heat of the weather, will generally bring about in the course of 12 or 15 days. Before the end of August the field should be cross ploughed, the grass seeds sown on the furrow, harrowed, and rolled. It is of much importance, in this part of the process, to avoid any delay, and therefore it is quite needful to put in the grass seeds, even if the weather should happen to be dry at the time; they will lay safe in the ground, and be ready to improve the benefit of the first showers, when the grass will soon make its appearance, and generally a good progress before the Winter sets in. If the Winter should prove favourable, nothing further is wanting to secure a good and lasting field of grass, than to draw the roller over it in the Spring, as soon as the frost gets out of the ground. This will set the roots of the young grass, which the frost will always heave up, and which, without rolling, would suffer from exposure to the sun and the wind. In case the Winter should prove unfavorable, the grass may be killed in spots. In this case, as soon as the frost is out of the ground, and it is not too wet, harrow the field over, and sow some fresh seed upon the spots, and roll over immediately.

The benefit of the harrow and roller in these cases, is wonderful. It acts like cultivation, improving immediately its appearance as much as a good hoeing does corn or potatoes.

If clover is the subject, Fall is not a good time to sow it. It suffers from the Winter. But it has always been found to do well, when sowed in the Spring, over the young grass, harrowed and rolled. Upon a gravelly soil which will not retain the grass, clover is advisable. Upon loam, I feel very little anxiety for clover, because it will smother the grass; and I esteem herdsgrass and red top to be a more valuable crop; they will last much longer, and give a fodder of much greater substance.

I shall now close these remarks, says the writer, by confirming a well settled opinion, that Fall is generally the most advisable and best season, with proper management and diligence, to sow grass seeds. The sun is then losing gradually its ardency, the earth is cooling with rains, and longer nights; it is that state of soil and of atmosphere, which is genial to grasses; it assists the rooting, the setting of the grass, by checking the growth of the top, and favouring the roots. But, after all, general rules are

subject to many exceptions, and particularly so in agriculture; therefore, the application and modification of the same, must be the study of every attentive farmer, in order to suit them to the nature and situation of his lands.

When grain is not a desirable article to be raised by the farmer, a crop of early potatoes will answer a very good purpose, and leave the land early enough, and in excellent order for grass seed.

Breaking up Grass Lands.—The Code of Agriculture has some general remarks on this subject, which we insert as the experience of the best agriculturists.

If the land be wet, it is advisable to drain it completely, previous to its being broken up.

Land that has been long in pasture, does not require dung during the first course of crops, that is taken after being broken up; but the application of calcareous manure, is always, in such cases, expedient. Sometimes lime is spread on the ground, before it is ploughed; at other times, marle and chalk have been used for the same purpose, with great advantage. The land thence derives additional strength and vigour; the succeeding crops are much improved; the soil is commonly so softened in its texture, that it may be ploughed with half the strength that would otherwise be necessary, and whenever it is restored to grass, the herbage is abundant.

Wherever the soil is not too shallow, nor of a friable nature, or when the turf cannot soon be rolled, if land is to be broken up from old pasture, paring and burning is the proper system to be adopted. In this way, good tilth is speedily procured; the damage that might otherwise be sustained by the grub, the wire worm, and other insects, is prevented; while the soil receives a stimulus, which insures an abundant crop.

When paring and burning, from any circumstance, cannot take place, the land may be trenched, or double-ploughed. This is effected by means of two ploughs following each other, the first plough taking off a thin surface of about three inches, and the second going deeper in the same place, covering the surface sod with fine mould; both furrows not exceeding the thickness of the vegetable mould, or other good soil.

If the land is ploughed with one furrow, the operation ought to be performed before winter, that it may receive the benefit of the succeeding frosts, by which the success of the future operations will not only be promoted, but most of the insects lodged in the soil will be destroyed.

When one furrow alone is taken, the best size is four inches and a half deep, by eight or nine broad. The strain on horses, in ploughing lay land, is mostly from the depth.

The rotation of crops to be adopted, when grass lands are broken up, must partly depend upon the soil, and partly on the manner in which it is prepared for cultivation. As a general principle, however, it may be laid down, that unless by the course of cropping to be pursued, the bad grasses and other plants, indigenous in the soil, are extirpated, they will, when the land is again laid down to grass, increase and prevail with more rapidity and effect, than the seeds chosen by the farmer; and the consequence must be, a heavy disappointment in the future crops of grass, perhaps solely, or at least principally attributable, to a previously defective management.

Advantages of New over Old Pastures.—The same law that renders alternation of grain and grass essential, applies with equal force to our pastures, although the opinion has prevailed, and with most persons is still popular, that old pastures are the best. To satisfy any farmer of the error of this opinion, let him appropriate an acre of old, and an acre of new pasture, recently laid down, to hay. If the land is of similar quality, he will find, that the new will give him two, three, and probably four times as much hay as the old. The same difference that we find in the hay, must exist in the pasture. The disparity appears not only in the quantity, but in the quality and duration. From the soil being more permeable to heat and air, the active agents of vegetable decomposition and nutrition, the grass starts earlier in the Spring, when in most demand, and continues to grow longer in Autumn, in the new than in the old pasture. The plough and the harrow, and a change of crops, are as necessary to renovate pasture, as they are to renovate meadow grounds. In noticing the modern system of Scotch farming in a recent work, we observed that on a farm of 500 acres, there was not an acre of grass, in pasture or meadow, which had been laid down more than two years..

As pertinent to the subject, we make the following extracts from a communication of Mr. Main, in the March No. of the Edinburgh Quarterly Journal of Agriculture.

"Struck, when a boy, with delight at the evergreen meadows of Doncaster, and the freshness, in the dead of Winter, of the fields near London, I could not, in settling in the north, help contrasting these—with a feeling almost bordering on disgust—with our whitey-brown *grass parks* of Scotland, wearing, in many places, a pale blue tint till the beginning of June, or puffed off in the newspapers, as affording 'a full bite' in the middle of May. I said to myself 'cannot industry and exertion produce a change in our grass lands? Perhaps we cannot expect to vie with Doncaster or London, but still something may be done.' So doffing

the gay soldier's coat, and putting on the hodden grey, I set to work, to try if fine pasture could not be got in Scotland.—Long did I toil at top-dressing,—all the never-failing, oft-recommended recipes of this compound and that compound, I tried in vain,—peat-earth, in all the varied shapes of mixture with lime and dung, soot, composts, with scrapings of ditches or other matter—all these I tried in various ways. I exhausted the pharmacopæia of agricultural quacks; and soon found out, that without the aid of plough and harrow, nothing could be done—in other words, that the ground must be put in *good heart* before you can have *good grass*.

"Well, that being done, I had fine grass; but it grew bad again; it was not fine *permanent pasture*. I had recourse, once more, to the old system of top-dressing, and of course improved the pasture, but again it fell off. By this time I had before my eyes the palpable fact, that new laid-down grass was good, and that, do what I would, old grass could not be made to bring the same rent.

"It appears to me, that only on certain soils and situations, pasture can be allowed long to remain without great loss; that such situations are flat meadows, or the neighbourhood of rivers or streams, rich in alluvial soil, and the natural habitat of the pasture plants, or in the vicinity of towns, where manure has been applied till the ground could not bring a grain crop to maturity; and that on all other situations, recourse must be had to the plough, as soon as a failure in the grass crop takes place; and the breaking up willl entirely depend on the quality of the land and manner it which it has been treated, there being no such true *unerring* guide to the *quality* of the land, as the length of time it can profitably be left in pasture. Little need be said on the unprofitableness of old pasture to the actual farmer. There is little old grass to be found on the farm of a man who has rent to pay. Have you never remarked the difference of rent that is given by a grazier or butcher, for a field of new and a field of old grass? Have you ever put the question to yourself, Why is this? I shall give you the answer: Let both fields be shut up and cut for hay, weigh the produce, see the great difference in favor of the new grass, and the secret is out. Still keep the cattle from the field; look at the new grass, how soon the aftermath springs! Well, then, is not the overplus of the hay that which would have fed so many more cattle? and yet people prate about old grass.

"Not only is the produce of an acre of new grass far greater than that of an acre of old, but it is more palatable to the cattle, and, as far as I have been able to observe, exactly in the ratio of the age of the grass. An example of this came lately under my

eye: A tradesman occupied a field which he cultivated regularly —breaking up a bit, green cropping it the following year, and then sowing it down, after which he pastured it by wethering his beasts. The man having left the place, I caused some hurdles (fence) to be put around the bit not in grass, and left the rest of the field in pasture. The cattle during the whole Summer, ate the new grass to the very earth, and did not taste the older, until the force of hunger made them do so. Next season the bit which had been hurdled off was sown out, and was allowed to go with the rest of the field. The very same thing took place—the new grass was first eaten, and then that which was older. I had an opportunity of observing last Summer the marked preference which sheep give to young grass, compared with old, by putting cattle into two fields, separated by a fence only,—one very fine grass of some years standing, the other only three years old; and pulling out some of the lower rails of a communicating gate, permitted forty sheep to pass through, and pasture in whichever field they pleased. The result was, they were constantly to be found in the field of younger grass, and very seldom went into the old grass inclosure. At last I was forced to shut them into the old grass, finding they were reducing the feed in the one, and leaving too much in the other. Be it always remembered that land must be well laid down. If grass, however new, be growing on poor land, or wet, or on land that has been badly cleared, cattle do not relish it. I have seen frequent instances of this. More particularly do they dislike pasturing on foul land.

"Having now broached the subject, I would not for the present, at least, pursue it any farther; but ere I take my leave, I would, in the first place, state, in corroboration of what I have been endeavoring to maintain, that by following the breaking up system instead of the top-dressing one, I have not only altered the verdure, but I have increased the rent of the old grass lawn on my farm from three to five fold. In conclusion, I would make a brief recapitulation of my sentiments: I maintain that except a few favored spots, as banks of rivers, &c., no ground can, without loss, be left long in pasture; that it appears to me four or five years is, generally speaking, the longest period land should be allowed to lie in grass; that if pasture be the object, at the end of that time, the ground should be broken up and returned to grass again. I maintain that *without grass*, severely cropped land cannot be restored to full fertility; and *without cropping*, grass cannot be made to continue at the maximum point of utility and verdure."

CHAPTER VII.

CULTIVATION OF ARABLE GROUND—ROTATION OF CROPS.

The proper distribution of crops, and a plan for their succession, is one of the first subjects to which a farmer, newly entered on a farm, requires to direct his attention. The kind of crops to be raised, are determined in a great measure by the climate, soil, and demand; and the quantity of each, by the value, demand, and the adjustment of farm labour.

In the adjustment of farm labour, the great art is to divide it as equally as possible throughout the year. Thus, it would not answer in any situation to sow exclusively Autumn crops, as wheat or rye; nor only Spring crops, as oats or barley; for by so doing, all the labour of seed time would come on at once, and the same of harvest work, while the rest of the year there would be little to do on the farm. But by sowing a portion of each of these and other crops, the labour both of seed-time and harvest is divided, and rendered easier, and is more likely to be done well and in season. But this point is so obvious, as not to require elucidation.

The succession or rotation of crops, is a point on which the profits of the farmer depend more than on any other. It is remarked by Arthur Young, that the agricultural writers, previous to the middle of the eighteenth century, paid but little or no attention to it. They recite, he says, courses good, bad, and execrable, in the same tone, as matters not open to praise or censure, and unconnected with any principles that could throw light on the arrangement of fields. The first writer who assigned due importance to the subject of rotations, seems to have been the Rev. Adam Dickson, in his *Treatise on Agriculture*, published in Edinburgh, in 1777; and soon afterwards, Lord Kaimes, in his *Gentleman Farmer*, illustrates the importance of the subject: both writers were probably led to it, by observing the effects of the Norfolk husbandry, then beginning to be introduced in Berwickshire. But whatever may have been the little attention paid to this subject by former writers, the importance of the subject of rotations, and the rule founded on the principles al-

ready laid down, that culmiferous crops ripening their seeds, should not be repeated without the intervention of pulse roots, herbage, or fallow, is now recognised in the practice and writings of all judicious cultivators, more generally, perhaps, than any other.

The system of rotations is adapted for every soil, though no particular rotation can be given for any one soil which will answer in all cases, as something depends on climate, and something also on the kind of produce for which there is the greatest market demand. But wherever the system of rotations is followed, and the several processes of labour which belong to it properly executed, land will rarely get into a foul and exhausted state.

The particular crops which enter into a system of rotation, must obviously be such as are suited to the soil and climate; though, as the valuable author so often quoted observes, they will be somewhat varied by local circumstances; such as the proximity of towns and villages, where there is a greater demand for turnips, potatoes, hay, &c. than in thinly peopled districts. In general, beans and clover, with rye-grass, are interposed between corn crops on clayey soils; and turnips, potatoes, and clover and rye-grass, on dry loams and sands, or what are technically known by the name of turnip soils. A variety of other plants, such as peas, tares, cabbages, and carrots, occupy a part, though commonly but a small part, of that division of a farm which is allotted to green crops. This order of succession is called the system of *alternate husbandry:* and on rich soils, or such as have access to abundance of putrescent manure, it is certainly the most productive of all others, both in food for man and for the inferior animals. One half of a farm is, in this course, always under some of the different species of *cereal gramina*, and the other half under pulse, roots, cultivated herbage, or plain fallow.

But the greater part of the arable land of this country cannot be maintained in a fertile state under this management; and sandy soils, even though highly manured, soon become too incohesive under a course of constant tillage. It therefore becomes necessary to leave that division or *break* that carries cultivated herbage, to be pastured for two years or more, according to the degree of its consistency and fertility; and all the fields of a farm are treated thus in their turn, if they require it. This is called the system of *convertible husbandry*—a regular change being constantly going on from aration to pasturage, and *vice versa*.

Not to repeat the same kind of crop at too short intervals, is another rule with regard to the succession of crops. Whatever

may be the cause, whether it is to be sought for in the nature of the soil, or of the plants themselves, experience clearly proves the advantages of introducing a diversity of species into every course of cropping. When land is pastured several years before it is brought again under the plough, there may be less need for adhering steadily to this rule; but the degeneracy of wheat and other corn crops, recurring upon the same land every second year for a long period, has been very generally acknowledged. It is the same with what are called green crops: beans and peas, potatoes, turnips, and in an especial manner red clover, become all of them much less productive, and much more liable to disease, when they come into the course, upon the same land, every second, third, or fourth year. But what the interval ought to be, has not yet been determined, and probably cannot (from the great number of years that experiments must be continued to give any certain result) be determined, until the component parts of soils, and particularly the sort of vegetable nourishment which each species of plant extracts from the soil, have been more fully investigated.

A change of the variety, as well as of the species, and even the plants of the same variety, is found to be attended with advantage; and in the latter case, or a change of seed, the species and variety being the same, the practice is almost universal. It is well known, that of two parcels of wheat, for instance, as much alike in quality as possible, the one which had grown on a soil differing much from that on which it is to be sown, will yield a better produce than the other, that grew in the same or a similar soil and climate. The farmers of Scotland, accordingly, find that wheat from the south, even though it be not, as it usually is, better than their own, is a very advantageous change; and oats and other grain, brought from a clayey to a sandy soil, other things being equal, are more productive than such as have grown on sandy soil.

System of Rotation.—The following are examples of rotations suited to different soils, as given in Brown's excellent *Treatise on Rural Affairs*. The basis of every rotation, he says, "we hold to be either a bare Summer fallow, or a fallow on which drilled turnips are cultivated, and its conclusion to be with the crops taken in the year preceding a return of fallow or drilled turnips, when of course a new rotation commences."

Rotation for strong deep lands.—According to this rotation, wheat and drilled beans are the crops to be cultivated, though clover and rye grass may be taken for one year in place of beans, should such a variety be viewed as more eligible. The rotation begins with Summer fallow, because it is only on strong deep

lands that it can be profitably practised; and it may go on for any length of time, or so long as the land can be kept clean, though it ought to stop the moment the land gets into a contrary condition. A considerable quantity of manure is required, to go on successfully: perhaps dung should be given to each bean crop; and if this crop is drilled, and attentively horse-hoed, the rotation may turn out to be one of the most profitable that can be exercised.

Rotation for loams and clays.—Where it may not be advisable to carry the first rotation into execution, a different one can be practised, according to which labour will be more divided, and the usual grains more generally cultivated, as for instance:

1. Fallow, with dung.
2. Wheat.
3. Beans, drilled and horse-hoed.
4. Barley.
5. Clover and rye-grass.
6. Oats or wheat.
7. Beans, drilled or horse-hoed.
8. Wheat.

This rotation is excellently calculated to insure an abundant return through the whole of it, provided dung is administered upon the clover stubble. Without this supply, the rotation would be crippled, and inferior crops of course produced in the concluding years.

Rotation for clays and loams of an inferior description.—This rotation is calculated for soils of an inferior description to those already treated of:

1. Fallow, with dung.
2. Wheat.
3. Clover and rye-grass.
4. Oats.
5. Beans, drilled and horse-hoed.
6. Wheat.

According to this rotation, the rules of husbandry are studiously practised, while the sequence is obviously calculated to keep the land in good order, and in such a condition as to insure crops of the greatest value. If manure is bestowed either upon the clover-stubble, or before the beans are sown, the rotation is one of the best that can be devised for the soils mentioned.

Rotation for thin clays.—On thin clays, gentle husbandry is indispensably necessary, otherwise the soil may be exhausted, and the produce unequal to the expense of cultivation. Soils of this description will not improve much while under grass; but, unless an additional stock of manure can be procured, there is a necessity of refreshing them in that way, even though

the produce should, in the mean time, be comparatively of small value. The following rotation is not an improper one:

1. Fallow, with dung.
2. Wheat.
3. Grass pastured, but not too early eaten.
4. Grass.
5. Grass.
6. Oats.

This rotation may be shortened or lengthened, according to circumstances, but should never extend further in point of ploughing, than when dung can be given to the fallowbreak. This is the keystone of the whole; and if it is neglected, the rotation is rendered useless.

Rotation for peat earth soils.—These are not friendly to wheat, unless aided by a quantity of calcareous matter. Taking them in a general point of view, it is not advisable to cultivate wheat, but a crop of oats may generally be depended upon, provided the previous management has been judiciously executed. If the subsoil of peat earth lands be retentive of moisture, the process ought to commence with a bare Summer fallow; but if such are incumbent on free and open bottoms, a crop of turnips may be substituted for fallow; according to which method, the surface will get a body which naturally it did not possess. Grass, on such soils, must always occupy a great space of every rotation, because physical circumstances render regular cropping utterly impracticable.

1. Fallow, or turnips with dung.
2. Oats of an early variety.
3. Clover, and a considerable quantity of perennial rye-grass.
4. Pasture for several years, till circumstances permit the land to be broken up, when oats are to be repeated.

Rotation for light soils.—These are easily managed, though to procure a full return of the profit which they are capable of yielding, requires generally as much attention as is necessary in the management of those of a stronger description. Upon light soils, a bare summer fallow is seldom called for, as cleanliness may be preserved by growing turnips, and other leguminous articles. Grass also is of eminent advantage upon such soils, often yielding a greater profit than what is afforded by culmiferous crops.

1. Turnips.
2. Spring wheat, or barley.
3. Clover and rye-grass.
4. Oats or wheat.

This is a fashionable rotation; but it may be doubted whether a continuance of it for any considerable period is advisable, because both turnips and clover are found to fall off when repeated so often as once in four years. Perhaps the rotation would be greatly improved were it extended to eight years; whilst the ground, by such an extension, would be kept fresh and constantly in good condition. As for instance, were seeds for pasture sown in the second year, the ground kept three years under grass, broke up for oats in the sixth year, drilled with beans and peas in the seventh, and sown with wheat in the eighth; the rotation would then be complete, because it included every branch of husbandry, and admitted a variety in management generally agreeable to the soils, and always favourable to the interests of cultivators. The rotation may also consist of six crops, were the land kept only one year in grass, though few situations admit of so much cropping, unless additional manure is within reach.

Rotation for sandy soils.—These, when properly manured, are well adapted to turnips, though it rarely happens that wheat can be cultivated on them with advantage, unless they are dressed with alluvial compost, marle, clay, or some such substances as will give a body or strength to them, which they do not naturally possess. Barley, oats, and rye, the latter especially, are, however, sure crops on sands, and in favourable seasons will return greater profit than can be obtained from wheat.

1. Turnips, consumed on the ground.
2. Barley.
3. Grass.
4. Rye or oats.

By keeping the land three years in grass, the rotation would be extended to six years, a measure highly advisable.

These examples are sufficient to illustrate the subject of improved rotations; but as the best general schemes may be sometimes momentarily deviated from with advantage, the same able author adds, that "cross cropping in some cases may perhaps be justifiable in practice; as, for instance, we have seen wheat taken after oats with great success, when these oats had followed a clover crop on rich soil; but, after all, as a general measure, that mode of cropping cannot be recommended. We have heard of another rotation, which comes almost under the like predicament, though, as the test of experience has not yet been applied, a decisive opinion cannot be pronounced upon its merits. This rotation begins with a bare fallow, and is carried on with wheat, grass for one or more years, oats, and wheat, where it ends. Its supporters maintain that beans are an uncertain crop, and cultivated at great expense; and that in no other way will corn, in equal quantity and of equal value, be cultivated at so

little expense, as according to the plan mentioned. That the expense of cultivation is much lessened, we acknowledge, because no more than seven ploughings are given through the whole rotation; but whether the crops will be of equal value, and whether the ground will be preserved in equally good condition, are points which remain to be ascertained by experience."

To adopt a judicious rotation of cropping for every soil, requires a degree of judgment in the farmer, which can only be gathered from observation and experience. The old rotations were calculated to wear out the soil, and to render it unproductive. To take wheat, barley, and oats in succession, a practice very common thirty years ago, was sufficient to impoverish the best of land, while it put little into the pockets of the farmer; but the modern rotations, such as those which we have described, are founded on principles which insure a full return from the soil, without lessening its value, or impoverishing its condition. Much depends, however, upon the manner in which the different processes are executed, for the best arranged rotation may be of no avail, if the processes belonging to it are imperfectly and unseasonably executed.

American System.—We have inserted the foregoing, with the view of apprising the reader of the present most approved system of rotation adopted in Great Britain. We are aware, however, that a great many farmers are unwilling to enter into such a systematic way of farming, and to leave the methods they have all their lives been practising.

It is a plan much adopted by many here, to pursue a rotation system of from two to three years, believing that grass lands get bound out, as it is sometimes called, and are not so profitable after three years old. The practice usually is, to plough up the greensward, manure and plant with corn, succeeded by a crop of rye or oats, and seeded down at the same time. That this plan has some advantages we are prepared to admit, more especially on very loose, sandy soils, and where the farmer does not care to raise ruta baga, turnips, and other such crops, for his cattle in Winter. But the *manner* in which the above rotation is performed, is altogether objectionable. The ground is usually harrowed *crossways*, by which means the sod is turned up, and exposed to the action of the atmosphere. This, in fact, totally destroys it. It should never be lost sight of, that the roots of a greensward will furnish a most superior body of *manure;* and that if we so bury them in the ground as to cause them to rot, we cannot but thereby greatly enrich the quality of the land.

To secure this great object, the sod should, in ploughing, be turned over quite flat and smooth; and it would be advisable to

carry the *first* furrow into the vacancy occasioned by the *last*. The ground should then be rolled. By this means the sod is completely buried, and being by nature moist, fermentation immediately commences, and consequent decomposition. After being rolled, the manure should be spread evenly over the surface, and harrowed in lengthways of the furrow. But if the ground be then harrowed crossways, the sod is immediately torn up and exposed, and the whole of its nutritive qualities are evaporated by the sun, wind, and rain.

Thus, then, the whole of the earth ploughed up is enriched by manure, with the double advantage, that that which is more towards the surface is fit for the immediate vivification and nourishment of the kernel, whilst the under coat (the grass roots) is preparing itself to afford the plant sustenance in its more developed state. The corn should then be planted; and care must be taken, that in horse-ploughing either for planting or cultivating, the plough does not go so low as to disturb the sod.

After the crop of corn has been taken off, the land is in most excellent condition for rye, and clover and grass seed; for the soil is not only well pulverised by the ploughings and hoeings it has received, but a great quantity of the nutritive part of the manure yet remains in it.

By adopting the above method, instead of the usual one, there cannot be a doubt that at least *double* the quantity of corn, rye, and hay, will be produced. We recollect to have read a statement by Mr. Phinney, of Massachusetts, who practised the above method on a piece of worn-out pasture land, which had long been considered almost worthless. We believe he gathered from it, to the acre, upwards of 50 bushels of corn, 26 of rye, and two and a half tons of prime hay!

The following is taken from "The Farmer's Guide," by Mr. Wm. Brown, of Rhode Island, and may serve as an outline of systematic cropping, to be varied as circumstances may require:

Light reddish sandy soil.—First crop, turnips, well manured with compost. Second, peas, with some gypsum. Third, rye, with red clover seed harrowed in with a light harrow in the Spring. Fourth and fifth, clover, with a light dressing of gypsum after each mowing.

Dark sand, and a sandy loam.—Indian corn with potatoes, may be the first crop. It is recommended to plant the corn in rows north and south, six feet apart, and in hills about two feet from each other. The rows of potatoes to be planted between the rows of corn. Indian corn, in order to afford the greatest quantity of ears, requires to stand more widely separated, than it is when grown in the usual way; while, at the same time, other plants, of more humble growth, may be raised in the intervals,

without essential injury to the growth of the corn. It would seem, that as much as one-fourth of additional aggregate product may in this way be raised from any given quantity of ground.—Second, turnips; then wheat or rye, if the turnips can be removed from the ground in time; then clover; then another crop of wheat or rye; then the Indian corn and potatoes again. Or barley with clover may come in after turnips.

Dry loam.—Some of these soils are good for Indian corn, especially the mellow reddish-coloured loams. The rotation may be similar to the last. Sometimes, the first crop should be potatoes, well dunged; then Indian corn, manured with gypsum.

Wet loam.—If very wet, few crops can be raised to advantage, except grasses. If not very wet, potatoes may be the first crop; let the ground be sufficiently mellowed with ploughing, and then very shallow furrows run for forming the beds for the dung; cover the seed with a furrow of a one-horse plough, run on each side, so that in this way the roots will be more elevated than is necessary in drier soils. After the potatoes are taken off, throw up the ground in high narrow ridges—mellow the ground in the Spring, and plant Indian corn on ridges to be raised by two furrows thrown up against each other. Ridge it again in the Fall; and in the Spring sow oats, barley, or Summer wheat, as most suitable. Good crops of flax may also be raised in such soils; and they are suitable for Winter wheat, where they are sufficiently dry to enable that crop to withstand frosts. Clover will do if the ground is sufficiently dry for wheat. When the grasses begin to fail, break up the ground. Oats, on the sward, if properly turned over, will do for the first crop.

Dark dry loams, are well calculated for an extensive rotation of crops, which may be similar to those mentioned for a dry loam. They are not generally so good for wheat as stiffer soils; nor for turnips as sandy ones.

Gravelly soils, are generally best adapted to crops of rye and red clover, alternately; and with gypsum and good ploughing, will bear tolerably good crops of each. In this way good crops of buckwheat may be had from such soils, which are naturally very poor; and this instead of rye, may be the intermediate crop between those of clover, from which the most profit is to be expected. Sanfoin will also answer for hard gravels. On fine gravels approaching to the nature of gravelly loam, crops of potatoes, Indian corn, and even wheat, may be had in rotation, beside clover, with suitable manures.

Gravelly loam, with the aid of gypsum and other suitable manures, is properly calculated for a rotation, say, first of potatoes, then Indian corn, followed by wheat in the Fall, after the corn has been cut up; or barley in the Spring, and then clover.—

Some of the mellower and richer sorts of this soil, may answer well for turnips, carrots, and other roots, and for almost all kinds of crops suitable for dry upland soils.

Clayey soils, if sufficiently dry, with a proportion of calcareous or silicious earth mixed with them, may be well suited for rotations of such culmiferous and leguminous crops, as may be found most advantageous; and also for some of the root crops. The rotation may be similar to that for dry loams, substituting the potatoe for the turnip crop. If the soil be a stiff dry clay, the first crop may be oats, well harrowed in the sward. Turn the stubble under, and in the Fall throw up the ground into high narrow ridges. In the Spring, cleave these down, and prepare the ground for barley, after manuring with suitable compost. Plough up immediately after harvest; put it in wheat in the Fall; and in the Spring harrow in clover and timothy seed. When the grass begins to fail, begin the rotation as before. When too wet for wheat, they admit of but little change; and should be kept mostly in timothy or other grass suitable to the soil. The changes may be oats, and then Summer wheat, or perhaps barley, as before mentioned.

It has been said, that the foundation of all good agriculture was the raising roots, as Winter food for cattle. What other cultivation can enable a farmer to raise on a specified quantity of ground, so great a quantity of excellent food? On lands like ours, of medium character, in point of fertility, manures in abundance are indispensable. These cannot be obtained in sufficient quantities, especially in interior situations, but by cattle. A rich agricultural country must be in general a cattle raising country. New England cannot become a great cattle raising country, unless it make provision for their support during our long cold Winters, by raising roots upon an extensive scale. Instead of the farmer's understocking his pasture ground, as is the case in most parts of the country, through fear of not being able to maintain his Summer stock on his Winter food, this system enables him to stock his pastures up to their full power. We therefore recommend, that in addition to the introduction of ruta baga, mangel wurtzel, cabbages, and common turnips into the regular rotations, that the farmer appropriate every year more or less land of a suitable quality to carrots and parsnips, which requiring uncommon preparation, are not so suitable to enter the list of a general rotation of crops.

Mr. Nicholson's calculation of the value of crops, and the expense of raising each, may be some guide in making selections for rotations. He supposes the average crops of wheat, barley, and Indian corn, at the greatest extent, may be $50 per acre when the grain is ready for market: crops of rye, oats, and peas,

not more than two-thirds of this amount; buckwheat, still less. From five to six hundred bushels of ruta baga, or mangel wurtzel, may be had from an acre, and worth at 18 cents, $100 per acre. And these roots are suitable for almost all the purposes of grain for live stock. As grain crops are nearly as expensive as roots, the clear profit will be from $30 to $50 per acre less than roots.

The following six years' rotation recommended by a writer in the Massachusetts Agricultural Repository, may be a good one for farmers in general in New England.

1st year. After breaking up the sward is oats sown, thick, to be cut for fodder.

2d year. Potatoes or Indian corn, or both.

3d year. Ruta baga.

4th year. Barley or wheat, sown with clover and herdsgrass, or red top.

5th year. Clover mowed.

6th year. Herdsgrass and clover.

In the Autumn of the sixth year, the land to be broken up, and on the seventh year the same rotation recommenced.

It is difficult to designate particularly the most suitable changes of crops; as they are more exactly to be ascertained by the known product of lands, when properly cultivated. But such crops, in rotation, as are found to yield most clear profit, and are at the same time best suited to follow each other, should usually be cultivated, after making due allowance for the greater exhaustion of the soil, occasioned by the growing of some more than others.

Another writer in our own country, the author of the "Treatise on Agriculture," says:—"On the rotation system, the whole *arable* part of a farm is divided into four, six, or eight fields, and subjected to a course of crops, denominated (according to the number of these divisions) the short, the medium, or the long course. In constructing these courses, however, whether long, middling or short, the utmost attention is paid to the nature of the soil, viz.: In all soils more wet than dry, more compact than porous, more hard than friable, the course is made up from the following plants, *wheat*, *oats*, *buckwheat*, the *graminеal grasses*, *brans*, *vetchlings*, *clover*, *cabbages* and *chicory*. In soils of an opposite character (dry, porous and friable), the plants from which to choose, are, *rye*, *spelts*, *barley*, *potatoes*, *turnips*, *lupins*, *Indian corn*, *clover*, *sanfoin*, and many of the pasture grasses. In loams (which are nearly an equal mixture of sand, clay, and decomposed vegetables), the choice of plants is much enlarged; embracing what is more peculiarly proper for both sand and clay, and having besides, the following plants from

which to select: *rice*, *millet*, *sorquin* (African millet), *lucern*, *indigo*, *cotton*, *hops*, *tobacco*, *madder*, *hemp*, *flax*, *&c. &c.* The following cases, will sufficiently illustrate the principles on which they rest, viz.: *Never to select for a crop, plants not adapted to the soil,* and *never, in any soil, to permit two crops of the same species, or kind, to follow each other.*"

We cannot believe, that, favoured as we are with a temperate climate, with a productive soil, with an inquiring, reflecting, and independent yeomanry, and with civil institutions, which favour and protect all the developments of industry and genius, we shall long remain behind the serfs of Tuscany, the tenants of England, or the peasants of Flanders. But to rival these, we must follow their example; we must multiply the means of subsisting cattle; because these will in their turn give manures, and manures will quicken and invigorate the soil for the production of articles of the greatest value and the highest price. It is on this simple basis, that we offer the following tables of a rotation of crops adapted to our own circumstances.

Medium course in sandy soils.—1st year, potatoes dunged; 2d, rye, with turnips after harvest consumed on the fields; 3d, oats and clover, or barley and clover; 4th, clover; 5th, wheat, with turnips after harvest, consumed on the fields; and 6th, peas or lupin, or lentils. We have, by this course, *eight* crops in *six* years, and five of these ameliorating crops.

Medium course in sandy soils.—1st year, potatoes dunged; 2d year, wheat with turnips, as in the preceding course; 3d year, Indian corn and pumpkins; 4th year, barley and clover; 5th year, clover; 6th year, wheat and turnips as before. In this course, we have *nine* crops in six years—five of which are ameliorating crops; and

Medium course in clay soils.—1st year, oats with clover; 2d, clover; 3d, wheat; 4th, beans dunged; 4th, wheat; 6th, the yellow vetchling.

MEMORANDA.—In this system of regular rotations of crops, it is important to remember, says the Memoirs of the Board of Agriculture of New-York,

"1st, That alternate or convertible husbandry, where leguminous plants, as rape or turnips, precede corn or wheat, and grass succeeds to wheat or barley, is the true method to be followed.

"2d, That the fewer white crops, the less the ground is exhausted.

"3d, That if the respective crops are kept at a distance, the soil will be less exhausted by any particular crop. In a long rotation of a series of eight crops, it is better that wheat should

come in the third and seventh years, than in the third and sixth. The clover pastured the sixth year, will better prepare the soil for so exhausting a crop as wheat. The intervening crops relieve the soil, if they succeed each other judiciously.

"4th, That in weak soils, the ground should be pastured now and then.

"5th, That the crops succeed each other seasonably, so that the same hands and cattle can attend them all. For instance: the wheat got in the Fall or Spring, harvested in August; the oats next; the barley next, harvested in September; the rape sown in June and July, fed off the land; the turnips sown in June and July, drawn in November.

"6th, In foul land, those crops are to be preferred, which, being under the hoe, keep weeds out, as turnips or potatoes, succeeded by Indian corn.

"7th, That it is better to carry the rotation on in three, four, or six different fields, according to the crops of the series, than to have the whole series pursued in one or two fields. It is unwise to mix crops of grain in one field, as it is certain that the inferior kinds of grain will injure wheats, if they blossom together; and it is very inconvenient to have green crops and grain growing in the same field. The farmer, then, who is determined to pursue the rotation system, should divide his farm into fields of equal size, and they should not be larger than the strength of team he employs. Where that strength consists of two teams, and the land is easy of tillage, a field of ten acres can be ploughed in five days. There is more gained in the economy of farming, by attention to these points, than many men are aware of."

CHAPTER VIII.

CULTURE OF INDIAN CORN.

This is a native of South America. There are many varieties of it, some of which are only fitted for the warm and long summers of the Southern states. The *white* and the *yellow* (of 8 and 12 rows) are the sorts generally preferred here. There is no crop more beneficial to the American farmer, than Indian corn. It is convertible into human food in more forms than any other grain; its value in fattening domestic animals, is not exceeded by any product of the farm; and no crop returns more to the soil than this does, in the form of manure. With proper culture, it grows well in a great variety of soils; but prefers old and rich pasture grounds, artificial meadows, warm loams, and moist vegetable mould.

"The *soils best adapted to the culture of Indian corn*," says Judge Buel, "are such as are permeable to heat, air, and the roots of the plant, and embrace those denominated sandy, gravelly, and loamy. Corn will not succeed well on grounds that are stiff, hard, or wet. The roots grow to as great a length as the stalks, and the soil must be loose to permit their free extension.

"*The manures used* are generally yard and stable dung, and plaster of Paris (*sulphate of lime*). The first ought to be abundant; as upon the fertility which it induces, depends the profit of the crop. Long or unfermented manure is to be preferred. It decomposes as the wants of the plant require it; while its mechanical operation, in rendering the soil light and porous, is beneficial to the crop. It should be equally spread over the whole surface, before it is ploughed under. It then continues to afford fresh pasture to the roots, till the corn has matured, and is in its place to benefit the succeeding crop. If put into the hills, the roots soon extend beyond its influence, it does not so readily decompose, and the subsequent crop is prejudiced from its partial distribution in the soil. In a rotation of four or five years, in which this crop receives the manure, twenty-five or thirty ordinary loads may be applied to *one* acre, with greater profit, than to *two* or *three* acres. Every addition tells in the product;

and there is scarcely any danger of manuring too high for this favourite crop. Gypsum is applied broadcast before the last ploughing or harrowing, or strewed on the hills after hoeing. I pursued the first method, at the rate of a bushel to the acre.

"*The best preparation for a corn crop* is a clover or other grass lay, or lea, well covered with a long manure, recently spread, neatly ploughed, and harrowed lengthwise of the furrow. A roller may precede the harrow with advantage. The time of performing these operations, depends upon the texture of the soil and the quality of the sod. If the first is inclining to clay, or the latter tough or of long continuance, the ploughing may be performed in the Spring, and as near to the planting as convenient. The harrow, at least, should immediately precede planting. All seeds do best when put into the fresh-stirred mould. Stiff lands are ameliorated and broken down by Fall ploughing; but light lands are rather prejudiced by it. When corn is preceded by a tilled crop, the ground should be furrowed, and the seed deposited in the bottoms of the furrows. Where there is a sod, the rows should be superficially marked, and the seed planted upon the surface. Where the field is flat, or the subsoil retentive of moisture, the land should be laid in ridges, that the excess of water which falls may pass off in the furrows.

"*The time of planting* must vary in different districts, and in different seasons. The ground should be sufficiently warmed by vernal heat, to cause a speedy germination. Natural vegetation affords the best guide. My rule has been, to plant when the apple is bursting its blossom buds, which has generally been between the 12th and 20th of May.

"*Preparation of the seed.*—The enemies to be combated are the wire-worm, brown grub, birds, and squirrels. Of these, the first and two last prey upon the kernels, and against these tar offers a complete protection. I soak my seed twelve to twenty hours in *hot* water, in which is dissolved a few ounces of crude saltpetre, and then add (say to eight quarts of seed) half a pint of tar, previously warmed and diluted with a quart of warm water. The mass is well stirred, the corn taken out, and as much plaster added as will adhere to the grain. This impregnates and partially coats the seed with the tar.

"*The manner of planting* is ordinarily in hills, from two and a half to six feet apart, according to the variety of the corn, the strength of the soil, and the fancy of the cultivator. The usual distance in my neighbourhood is three feet. Some, however, plant in drills of one, two, and three rows, by which a greater crop is unquestionably obtained, though the expense of culture is somewhat increased. *The quantity of seed* should be double, and may be quadruple, what is required to stand. It is well known

that a great difference is manifest in the appearance of the plants. Some appear feeble and sickly, which the best nursing will not render productive. The expense of seed, and the labour of pulling up all but three or four of the strongest plants in a hill, it is believed will be amply remunerated by the increased product. If the seed is covered, as it should be, with fine mould only, and not too deep, we may at least calculate upon every hill or drill having its requisite number of plants.

"*The after culture* consists in keeping the soil loose and free from weeds, which is ordinarily accomplished by two dressings, and in thinning the plants, which latter may be done the first hoeing, or partially omitted till the last. The practice of ploughing among corn, and of making large hills, is justly getting into disrepute; for the plough bruises and cuts the roots of the plants, turns up the sod and manure to waste, and renders the crop more liable to suffer by drought. The first dressing should be performed as soon as the size of the plants will permit, and the best implement to precede the hoe is a corn harrow, adapted to the width of the rows, which every farmer can make. This will destroy most of the weeds, and pulverise the soil. The second hoeing should be performed before or as soon as the tassels appear, and may be preceded by the corn harrow, a shallow furrow of the plough, or what is better than either, by the cultivator. A slight earthing is beneficial, providing the earth is scraped from the surface, and the sod and manure not exposed. It will be found beneficial to run the harrow or cultivator a third, and even a fourth time, between the rows, to destroy weeds and loosen the surface, particularly if the season be dry.

"*In harvesting the crop*, one of three modes is adopted, viz. 1. The corn is cut at the surface of the ground, when the grain has become glazed, or hard upon the outside, put immediately into stooks, and when sufficiently dried, the corn and stalks are separated, and both secured. 2. The tops are taken off when the corn has become glazed, and the grain permitted to remain till October or November upon the buts. Or, 3. Both corn and stalks are left standing till the grain has fully ripened, and the latter become dry, when both are secured. There are other modes, such as leaving the buts or entire stalks, in the field, after the grain is gathered; but these are so wasteful and slovenly as not to merit consideration. The stalks, blades, and tops of corn, if well secured, are an excellent fodder for neat cattle. If cut, or cut and steamed, so that they can readily be masticated, they are superior to hay. Besides, their fertilizing properties, as a manure, are greatly augmented by being fed out in the cattle yard, and imbibing the urine and liquids which always there abound, and which are lost to the farm, in ordinary yards, with-

out an abundance of dry litter to take them up. By the first of these methods, the crop may be secured before the autumnal rains; the value of the fodder is increased, and the ground is cleared in time for a Winter crop of wheat or rye. The second mode impairs the value of the forage, requires more labour, and does not increase the quantity, or improve the quality, of the grain. The third mode requires the same labour as the first, *may* improve the quality of the grain, but must inevitably deteriorate the quality of the fodder. The corn cannot be husked too promptly after it is gathered from the field. If permitted to heat, the value of the grain is seriously impaired.

"*Saving seed.*—The fairest and soundest ears are either selected in the field, or, at the time of husking, a few of the husks being left on, braided and preserved in an airy situation till wanted for use.

"*In making a choice of sorts,* the object should be to obtain the varieties which ripen early, and afford the greatest crop. I think these two properties are best combined in a twelve rowed kind which I obtained from Vermont some years ago, and which I call Dutton corn, from the name of the gentleman from whom I received it. It is earlier than the common eight rowed yellow, or any other field variety I have seen, and at the same time gives the greatest product. I have invariably cut the crop in the first fourteen days of September, and once in the last week in August. The cob is large, but the grain is so compact upon it, that two bushels of sound ears have yielded five pecks of shelled grain, weighing 62 lbs. the bushel."

It is stated in the Genesee Farmer, that along the valley of the Mohawk, two varieties of the yellow corn are principally cultivated; the one a lightish yellow corn with twelve rows of kernels upon a cob, and the other a bright and deeper yellow, with only eight rows. In conversing with a very intelligent agriculturist in the city of Schenectady, I learned a fact, says the writer, which has not before come within my own observation.

It has been customary for a long period, for the Dutch settlers on the Mohawk to cultivate the twelve rowed corn, believing that as the ears were larger, and contained one third more kernels, the aggregate yield must be proportionally large.—Others, on the contrary, have rather inclined to the eight rowed. The intrinsic value of these two kinds have been frequently tested, and the result has proved the eight rowed corn to be the most valuable, though it is hard to make a superficial observer believe it.

Two bushels of twelve rowed ears when shelled will yield only one bushel of corn, and frequently will fall a little short. Two

bushels of the same length ears of eight rowed, will yield generally a bushel and three or four quarts of shelled corn.—The reason of this is, that although there is one third more kernels on the twelve rowed ear, yet the cob of the eight rowed is so much smaller and the kernel so much larger, the quantity of *shelled* corn is considerably in favour of the eight rowed.—Another circumstance in favour of the eight rowed corn is, that there are generally two ears on each stock, while upon the twelve rowed, there is rarely more than one; so that on an acre of ground, the number of bushels of ears will be rather in favour of the eight rowed, though the ears are rather less in size. The eight rowed corn also comes to maturity about a fortnight sooner than the twelve rowed, which is a desirable quality, especially in a cold or short season.

It is an attested fact, though farmers do not seem to practice upon it, that it is necessary to adapt the different varieties of seed to the soil, as it is the breed of cattle or sheep. One description of corn is better suited to a particular soil, than another; and so of grain. Most farmers know that the different varieties of wheat will yield more or less as they are cultivated upon different soils. It seems, then, that in the selection of seed corn for yield and profit, a careful attention should be paid to its nutritive quality; to its adaptedness to your soil; to the size and weight of the kernel, and the size of the cob; to the number of ears usually reared upon a stock; and to the early maturity of the plant.

Sufficient attention has not been bestowed upon this subject, as there is doubtless as much difference in the yield of the different varieties of corn, as there is in any other grain or fruit.

In securing the fodder, precaution must be used. The buts become wet by standing on the ground, and if placed in large stacks, or in the barn, the moisture which they contain often induces fermentation and mouldiness. To avoid this, put them in stacks so small, that the whole of the buts are exposed upon the outer surface; and when thoroughly dry they may be taken to the barn, or left to be moved as they are wanted to be fed out—merely regarding the propriety of removing a whole stack at the same time.

Topping Corn.—A practice prevails with some, if not most farmers, of topping their corn for the purpose of fodder. It is exceedingly questionable whether this be judicious. Lorain says,

"It was discovered early in August, 1810, that proper grasses for soiling my cattle would soon be very deficient; and on the 20th of that month, one row of corn in a field of thirteen acres, was topped to ascertain how the plant would bear early cutting.

it was thought that it had received no injury. On the 31st of the same month, I commenced feeding the cattle with the tops cut daily as wanted. These lasted them until the 18th of September. After this the blades were stripped, commencing where the toppings began. They fed the cattle until the 5th of October.

"In the process of topping and blading, one row was left entire, standing between the row which had been topped on the 20th August, and another row which was topped on the 2d of September. These rows were cut off by the roots on the 2d of October, and hauled in, and set up separately under my own inspection. They were husked and measured on the 8th of November.

"Produce of the row that had not been topped and stripped, nine bushels and five-eighths of corn in the ear.

"One of the rows which had been topped and stripped, measured seven bushels and six-eighths; and the other topped and stripped row measured seven bushels and three-eighths of corn in the ear.

"Thus it clearly appears that mutilating the corn plant before its fruit is perfected, is a very injurious practice. The injury done to my crop by this mode of management, was clearly seen some time before the three experimental rows were cut off. Throughout the whole field the husks were generally dry and open, except on the row which had not been topped and stripped. On this they still retained a greenish hue, and were close set to the ear when the plants were cut off by the roots.

"In 1811, I selected three rows of maize in the middle of my field, as nearly alike as possible. The plants were then about two feet high. I cut off the tops of the middle row as low down as might be readily done without injuring the tassels, which were wrapped in their own leaves within the stalks. I could not observe that the stalks in the row which had been cut, grew any thicker, until new leaves had been formed from the crown of the plants. Before this happened, the stalks in the rows on either side of it, seemed to be as thick again as those standing in it; and the ears grown on the plants in this row, shot filled, and ripened about two weeks later than the rest of the field.

"As several writers on agriculture had asserted that the tops of potatoes might be cut and given to the cattle without injury to the crop, I cut off the tops from a row running through the middle of a very luxuriant patch. Care was taken to cut them in that way which was supposed least likely to prove injurious to the future growth of the plants. The debilitated appearance of the second growth of the tops, determined me not to risk the second cutting of them. When the crop was gathered, the roots

in the row that had been cut, did not seem to be more than half as large as those in the rest of the patch.

"In fact, I have never seen any advantage arise either from carefully trimming or ruggedly mutilating annual plants; on the contrary, much injury certainly follows. It is, however, probable that good housewives and ignorant gardeners will continue to tread and mutilate the tops of their onions, as long as the world may happen to last, for the express purpose of making the roots grow more luxuriantly; unless, perchance, they may happen to reflect, that the tops would not have existed, if nature did not consider them as necessary to the well-being of the plant as its roots. Certain it is, that the writings of many gentlemen who ought to have known better, are exactly calculated to confirm them in this truly savage practice."

Early Corn.—There are three varieties of corn that every farmer should plant, expressly for using green, without reference to it as a field crop. There are but few people in this country but are fond of boiled green corn; and by a little extra pains the season for using it may be lengthened three or four weeks; that is, it may be procured one month earlier than it generally is by the common field culture.

The varieties which we would recommend are the *Golden Soix*, *Flour Corn, or York Cheat*, and the *Sweet Corn*.

Golden Soix is the earliest corn with which we are acquainted; the ear is small but well shaped, and the corn is well flavoured.

Flour Corn, or *York Cheat*, is a white soft corn, which comes in soon after the former; the ears are of good size, and it does not become hard and flinty, like common corn, on which account it continues longer fit for use. This will last until the sweet corn is fit for use. It was named York Cheat, because it was said to have been ground with wheat, in the early settlements of this country, when it could not be detected by the colour of the flour. When broken, the inside of the kernel is white and mealy.

Sweet Corn.—This is undoubtedly superior to all other varieties for boiling: is very sweet; and unlike other varieties, it remains soft until it hardens by drying, when it becomes much shrivelled.

Either, or all of these varieties, may be planted in hot beds, or in light boxes of earth, which may be kept in warm situations about a house, until the fore part of May, when the plants may be taken out of the beds or box, and planted in hills in open ground, putting plenty of manure under the hill, and setting the plants pretty deep in the soil, so that if the tops should be killed by late frosts, the roots would not be injured.

CHAPTER IX.

CULTURE OF WHEAT.

Of wheat there are a great variety of sorts. We shall enumerate a few.

Spring wheat.—This is probably a native of Southern Siberia and Sicily, whence its culture has been gradually dispersed throughout Europe. Its varieties are, Spring wheat with a red spike or ear and grain; red Spring wheat with a white ear; and Spring wheat with a white spike and grain. These and all other varieties of the same species are beardless; and may be sown from the end of February till early in May. It ripens about the same time as the Winter or common wheat, and is not easily affected by moisture or severe frost.

Winter, or common wheat.—This is principally raised in Britain; its grains are somewhat fuller than those of the preceding species, and its chief varieties are, common wheat, with a red ear and grain; common wheat, with a white ear; or Winter wheat, with white ears and grains. These varieties are also destitute of beards, and should not be sown earlier than in September, nor later than in. November. They produce the most valuable wheat, which yields the largest proportion of flour.

Beside the foregoing there is the *thick-spiked* or *cone wheat*, each plant bearing from four to eight ears. It differs from the preceding, both in its bearded ears, and its small plump grains, which are more convex on the back than those of the Spring or Winter wheat.

The *Polish wheat*, resembles the preceding species; but its stalks attain the height of five or six feet; the leaves are white striped, from 12 to 24 inches in length. It is not much cultivated. From the height of its stalks, it is apt to lodge and injure the quality of the wheat.

Spelt or *German wheat*, is principally raised in that country, and nearly resembles barley; though its stalks are shorter. This wheat yields a flour of finer quality, and better for the purpose of pastry, than common wheat. It is also said to withstand the at-

tack of insects, and will grow in poorer soil, and with less preparatory labour.

There is also *Siberian Spring wheat*, *Switzerland Spring wheat*, *Egyptian wheat*, and *Zealand wheat*.

But the two principal sorts of wheat usually cultivated here, are, the Winter wheat which is sown in the Fall, and Spring wheat which is sown in the Spring.

Winter wheat is to be considered as of two kinds: red and white wheat. The red kind is in little estimation here, and very little grown; it makes good flour, and there are some varieties of it which might be productive in this country; bnt the grain is so small, and so inferior in appearance, that it will probably never become a favourite among us.

White wheat is generally cultivated, and is divided into two kinds, each having numerous varieties. The favourite kind is the thin-chaffed; it is thought to be less susceptible of disease, and in the moist climate of Britain, is highly valued on that account. The thick-chaffed kind is an excellent wheat, and is not very often diseased here, probably owing to our fine dry summers.

Soil and Preparation.—Wheat succeeds best upon stout loams, and it is rarely cultivated to advantage upon light soils, which are better fitted for barley. Where wheat is cultivated upon a large scale on farms where rotations are not observed, the success of the crops, all other circumstances being right, will depend upon the ground being well tilled, and clear of all weeds. In this dry and hot climate it is easily effected; but except on new lands, it is seldom very profitable, and the crops ought at any rate to be preceded by a thorough Summer fallow, which with very few exceptions, is an operation totally unnecessary. Stiff and wet clays which are foul, alone require Summer fallow. In Great Britain, the preparation of the soil is an object of the greatest solicitude, because the climate is extremely moist; but in this country, two ploughings judiciously timed and executed, are as operative as four there. Under the old system of fallows, the labour and expense bestowed upon a wheat crop was enormous. Two years and five or six ploughings, were sometimes given to this preparatory culture. But under the new, it takes for granted that the diminished number of ploughings are well performed; that no clods are to be seen, and that the field presents an unbroken surface of mellow and finely pulverised earth.

A clover *lay* is considered the best preparation for wheat. The wheat ground should be heavily set in clover, and broken up after harvest, with three horses, when the seed in the clover is ripe. By thus turning down clover after harvest, when the

seed is ripe, it will never miss coming up in the Spring, which frequently is the case, when sown in the Spring with seed. When clover is ploughed down after harvest, before you seed the field, you must harrow it with a light harrow, the way you have ploughed it, in order to level the ground, and prevent the seed from rolling between the furrows, and coming up in rows. Never plough your seed in with shovels, nor harrow it in across the ploughing, when you have turned down clover after harvest, lest you raise the clover; but harrow it in by twice harrowing, with light harrows, the way you have broken up your ground. Many farmers have ploughed down clover once, and finding their crop not improved by it, have never attempted it again. This is almost invariably the case, the first time clover is ploughed down after harvest, especially if the Fall be dry, and the Winter frigid and close.

In turning clover down, you must necessarily plough the ground deep, and the first time you do it, you turn up the clay, which being unmixed with manure of any sort on the top, it is in a bad state to sow wheat in. The wheat after some time will sprout and come up, but will look yellow and very spindling. Its roots sometimes will get down among the unrotted clover, and there will choak, and for want of moisture, a great deal of the wheat will dwindle away and die. The unrotted clover, too, below, will keep the ground loose and springy, so that the frost will injure it not a little.

But when clover is ploughed down a second time on a field, those bad effects to the wheat crop, arising from unrotted clover, are not experienced. You then turn up the clover from below, which was ploughed down before, and which is a manure on the top. The seed sown on it now springs up directly, and before the Winter sets in, has taken deep root, and spread in large green flourishing branches. The clover now turned down soon rots, in consequence of the rotten clover turned up, which, as manure, always keeps the ground moist, however dry the Fall.

Selection and Preparation of Seed.—Seed should be taken from some fine crop of the preceding year, which shall have ripened thoroughly, and been well preserved. This after passing two or three times through the fanning mill, should be carefully washed in clean water, and again in water in which a quantity of fresh lime has been slacked, or (if the lime cannot be had), in which clean wood ashes have been leached. This washing should never be omitted, because besides detecting the shrunk or shrivelled grains, and many seeds of other plants (which will float on the surface of the water), it entirely removes the *dust* of *smut* and *rust*, &c., and thus prevents their propaga-

tion. Our next step in this process, is to roll the seed in pulverised gypsum. These are the directions of the author of the Treatise on Agriculture. They are strongly corroborated by the following, from the Report of Select Farms, in the Library of Useful Knowledge:

"The seed is selected of the best quality of the *previous year's growth*, and perfectly clean and free from all other seeds. The red straw lammas is the kind that is always sown upon this farm. No such thing as smut is ever known upon the farm, which is prevented, we believe, by the invariable use of old wheat for seed. When wheat that has been harvested in August, is sown again on the first of September, it has not had time to be so well hardened and so perfectly prepared for vegetation as it ought to be; and therefore does not produce a crop so perfect in every respect as old seed; and hence the smut."

The following method of preparing seed is given by a Virginia cultivator:

"When I am about to commence seeding, I have two barrels prepared, one of which I have filled about two-thirds full with brine, strong enough to bear an egg, into which I have the seed poured very slowly, until the brine rises nearly to the top, which will be covered with the light grains of wheat, cheat, and garlic, which are skimmed off with the hands, and the wheat at the bottom stirred once or twice to free it from any remaining impurities, which are again skimmed off. An old basket without a handle is then placed on the top of the empty barrel, through which the brine is poured from the wheat by two men taking the full barrel by its bottom on opposite sides. The wheat is then emptied into a large box, and the same process repeated from one barrel to the other alternately, until a sufficient quantity is washed for the day's seeding, and as much gypsum is then stirred into the whole mass as will adhere to the grain. Water is added occasionally, and a sufficiency of salt to maintain the strength of the brine, which is tested by an egg kept at hand for the purpose. The whole process is completed in the morning, by the time the teams are ready to proceed to their work. I suppose a bushel of salt would probably suffice for one hundred bushels of seed, which would by reason of its invigorating qualities, be very well bestowed in that way, independently of its aid in freeing the wheat from its impurities.

"If the wheat is infected with smut, it will be effectually destroyed, by stirring in a portion of quick lime before the gypsum."

SOWING.—This resolves itself into two heads; *time* and *manner* of sowing, *together with the quantity of seed*.

With regard to the *time* of sowing, there is a difference of opinion, some giving the preference to early, others to late sowing. Some sow in the full, others in the wane of the moon.

Theory is certainly on the side of early sowing, because it gives time for the roots of the grain to establish themselves before Winter; and experience proves that grain early sown, throws up more lateral stems than that which is sown late.

It is stated, however, in the Vermont Chronicle, that in consequence of some suggestions made in that paper, on the late sowing of Spring wheat, as the means of saving it from the ravages of the *weevil*, a number of persons were induced to try the experiment, which resulted in entire success. A farmer in Orange county, stated to the editor, that he sowed one acre of Spring wheat, ten days later than the rest, in the same field. The first sowed was seriously injured, the last not all. Similar statements were made by several other persons.

Mr. Nicholson (in the Farmers' Assistant), says, "the time for sowing wheat, probably depends much on previous habit. Thus, if it were sown a number of successive years by the middle of August, and then the time of sowing were changed at once to October, the crop would probably be lighter on that account." Mr. Nicholson adds, "The later it is sown, however, the more seed it requires. When early sown, a bushel to the acre is believed to be sufficient; but when sown later, a bushel and a half or more may be necessary."

The Code of Agriculture says, "the period of sowing the different grains, varies so much according to situation, soil, climate, species, and a number of other circumstances, that it is impossible to lay down any general rule, but this, 'that early sowing is, on the whole, to be recommended.'" It has been found, that in England, from the middle of September to the middle of October, is the best time to sow wheat.

Quantity of seed.—It is to be regretted, continues the Code of Agriculture, that the proportions of seed best calculated to afford the fullest and most abundant produce, in different crops, and under various circumstances, has not yet been decided by the aid of experimental investigation. With regard to wheat, says the author, when land is in high condition and adapted for the culture, more especially after a Summer fallow, about two bushels per acre has been found sufficient, in the best cultivated districts of Scotland. Bean stubbles require more seed than Summer fallows, because seed from the roughness of the surface, cannot be so equally distributed, and clover lays ought to have more seed than even bean stubbles. Turnip land sown with wheat in the Spring, must have a still more ample allowance, as the shorter period of growth does not allow a sufficient interval

for tillering, and many of the suckers that are produced, never come to maturity. In these cases, from three bushels up to rather less than four, may be required. In England it is calculated that about two bushels and a half is the medium quantity of seed wheat throughout the kingdom, though it is often more.

MANNER OF SOWING.—Wheat may be sown in three ways: *broadcast*, by *drilling*, and by *dibbling*. The broadcast method is the one commonly practised.

Drilling.—The introduction of the drill system is, by numbers of the most distinguished agriculturists, considered to be a most important improvement, and to be well entitled to universal adoption. It is principally recommended on the following grounds. 1. That the broadcast system is a less perfect and a less economical mode of cultivation, than that of drilling; for the seed can neither be deposited in the soil with the same exactness in regard to depth, regularity, or proportion, nor be so placed that the crop can afterwards be improved in its progress to maturity; 2. That in light soils, drilling has the important advantage of giving the grain a *good hold* of the ground, and of giving all the seed the same depth of soil, by which the frost is prevented from throwing out the plants in Spring, or the wind from loosening the roots after the stem gets high, or when the ear is filling; 3. That by the improved practices in drilling, the use of manures is both encouraged and economised, so as to diminish the quantity necessary, and to increase its powers, by bringing it into immediate contact with the plant, and that a heavy crop of drilled grain, where the weeds are thoroughly destroyed, will be found much less injurious to the fertility of the soil, though raised with less manure, than the same crop grown broadcast with a greater quantity of manure, but incumbered with weeds; 4. That it gives an opportunity for cleansing the ground, even when the crop is growing; of completely extirpating annual weeds; of checking the growth of root weeds; and of preventing weeds in general from being injurious to the crop; 5. That drilled crops are more equal in growth, and in general better in quality, than broadcast; 6. That drilling may be of use in regard to grub and vermin. That hoeing in the Spring may assist in destroying them, or at least by the treading of the hoers, and the stirring of the soil by the hoes, a check may be given to their depredations. The treading also may be of use in preventing the mildew.

Innumerable instances might be brought forward of heavy crops having been produced under the drill system, by those who bestowed much care in trying the experiment, and it has often answered, even on a great scale, when properly executed.

Dibbling, or *setting*.—This is a method, says the British Farmers' Magazine, which is reckoned one of the greatest improvements in husbandry, that was made during the last century. It seems to have been first suggested by planting grain in a garden for mere curiosity, by persons who had no opportunity of extending the cultivation for profit. This was first attempted at Norwich, and a few years after by one of the largest occupiers of land in Norfolk, who set fifty-seven acres in one year. His success from the visible superiority of his crop, both in quantity and quality, was so great, that in the following Autumn he set 300 acres, and has continued the practice ever since. This noble experiment established the practice, and was the means of introducing it generally among the intelligent farmers in a very large district; there being few who now sow any wheat, if they can procure hands to set it. It has been generally observed, that although the set crops appear very thin during the Autumn and Winter, the plants tiller and spread prodigiously during the Spring. The ears are indisputably larger, without dwarfish or small corn; the grain is of a larger bulk, and specifically heavier per bushel than when sown.

The lands on which this method is particularly prosperous, are either after a clover stubble, or on which trefoil and grass seed were sown the Spring before the last. These grounds, after the usual manuring, are once turned over with the plough in extending flag or turf, at ten inches wide; along which a man, who is called a dibbler, with two setting irons somewhat bigger than ramrods, but considerably larger at the lower end, and pointed at the extremity, steps backwards along the turf, and makes the hole about four inches asunder every way, and one deep. Into these holes the droppers (women, boys, and girls), drop two grains, which are quite sufficient. After this, a gate bushed with thorns is drawn by one horse over the land, and closes up the holes. By this mode three pecks of grain are sufficient for an acre; and being immediately buried, are equally removed from vermin, or the power of frost. The regularity of its rising gives the best opportunity of keeping it clear from weeds, by weeding or hand hoeing. Setting of wheat is a method peculiarly beneficial when corn is dear; and if the season is favourable, may be practised with great benefit to the farmer. Sir Thomas Beevor, of Hethel Hall, in Norfolk, found the produce to be two bushels per acre more than from the sown wheat; but having much less smaller corn intermixed with it, the sample is better, and always fetches a higher price to the amount generally of 2*s*. per quarter. This method, too, saves to the farmer and the public six pecks of seed wheat in every acre; which, if generally adopted, would of itself afford bread for more

than half a million of people. The expense of setting by hand is now reduced to about ten shillings per acre: which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five shillings per day; of which, if the dibbler gives to the children sixpence each, he will have himself 3*s*. 6*d*. for his day's work, which is more than he can earn by any other labour so easy to himself. But if he have a wife who dibbles with him, and two or three of his own children to drop to him, his gains will then be very important, and enough to insure a plenty of candidates for that work, even in the least populous parts of the country. But the profit of this method, in seasons when seed corn is very cheap, or the Autumn particularly unfavourable to the practice, must certainly be lessened.

TREATMENT, HARVESTING, AND PRODUCT.—Harrowing wheat and rye in the Spring, is considered by some European writers to be very beneficial; but doubtless, this ought to be done very carefully; and it is advised by some, that a roller be afterwards passed over the ground, to fix the plants which may have been disturbed by the harrowing. With regard to rolling, the Code of Agriculture says that wheat should *always* be rolled in the Spring after frosts, as it makes the soil adhere more closely to the roots of the plants, encourages vegetation, strengthens the stems, and renders the grain more perfect.

It is better to cut wheat rather before it is ripe, than to wait until the straw is uniformly yellow. A great deal of waste attends wheat, when it is suffered to become quite ripe before it is cut: in cutting, binding, pitching, and riding home, some will shell out; and it is a very common thing, a fortnight after harvest, to see a field as thickly covered with young plants, as if it had been sown over again. In this manner, a couple of bushels to the acre are lost, without taking into the account that which has not sprouted. By reaping or cradling it a little before it is ripe, if the grain be not quite as plump as otherwise it would be, at least it is compensated by saving that part of it which would have been wasted. It is got in in much cleaner condition, and the straw is better calculated either for fodder or any other purpose. It should be left as it is cradled 24 or 48 hours, according to the weather, as being more exposed to the sun and air, it will cure more perfectly than if immediately put into sheaves. This is very essential to be observed, for when put by in a damp condition, mouldiness is sure to take place, and it is diminished in value both for sale and for use.

Of the produce of wheat, very different accounts have been given. Some calculators have supposed, and on data not easily refuted, that the greatest produce of this grain over the whole

face of the globe, and in a series of any ten given years, will not exceed six bushels reaped for one bushel sown.

It has been calculated, that the average quantity of wheat per acre upon unmanured lands, throughout the northern, middle, and eastern states, (without taking in the new settlements, where the yield is greater,) is about thirteen bushels. In the southern Atlantic states, it is much less.

The average of crops of wheat in England, where the cultivation is supposed to be as fine as the present improved state of agriculture can render it, is rated by some at eighteen bushels per acre, by others at twenty-five. In the interior of this state, from twenty to twenty-five; and in Virginia, six or seven.

Spring Wheat.—The culture of Spring wheat differs from that of Winter wheat, in its requiring a more minutely pulverised and rather richer soil. It need not be sown sooner than April, and it advances so rapidly to maturity, that it scarcely affords time for harrowing and rolling, where those processes are used. When grass or clover seeds are sown on the same ground, they are sown immediately after the wheat, and harrowed in with a light harrow, or rolled in. In this respect, and indeed in all others, the preparation of the soil and sowing of this grain, are the same as for barley.

The produce of Spring wheat, both in grain and straw, is considerably less than that of Winter wheat; the straw is only fit for litter or inferior fodder; and the flour produced by the grain is rather coarser and darker, than that of common wheat. Of course, this sort of wheat cannot be recommended for general culture.

Crops of Spring wheat might be made more productive, if the quantity of seed sown were greater. Four or five pecks of seed for Winter wheat, are frequently sufficient under favourable circumstances; but it is probably safer to sow two bushels to the acre, as part of the seed unavoidably perishes by the agency of insects, birds, and the weather. In Spring wheat, it is essential to the prosperity of the crop, that at least that quantity be sown; for the stoles are frequently so feeble, and so few in number, owing to the shortness of the season, that some of the stalks are dwarfed, have small heads, and only begin to fill when the main stalk is ripening. It is important, then, to increase the quantity of main stalks, and this can only be done by sowing an additional quantity of seed.

CHAPTER X.

DISEASES OF WHEAT.

The two principal diseases to which wheat is subject, are *Rust* and *Smut*. Under the term Rust, we include blight and mildew; for these three diseases, if they are distinct, are so nearly allied, that for all practical purposes they may be considered as one.

Rust.—When crops, from an unfavourable change of their condition, become deteriorated, and the grain is shrunk and light, it is generally ascribed to *rust*, *mildew*, or *blight*.

In the discussions which have arisen on this subject, the following observations seem to accord:

That wheat and oats are more subject to disease than barley.

That thin-chaffed wheats escape, when thick-chaffed ones are affected.

That mildew and rust appear very suddenly, and generally in still moist weather.

That a brisk circulation of air will save crops that have been attacked.

That violent extremes of temperature, and cool nights succeeded by very hot suns, promote mildew.

That some fields are attacked, while others adjacent escape; parts of the same field also are here and there diseased.

That mildew and rust are both discernible from the changed appearance of the straw; in some cases being spotted all over, in others covered with a brownish rust.

That the grain reaped from diseased crops is shrunk, comes out very light, and is scarcely saleable.

Causes of Rust.—There are many causes which may probably contribute to the production of rust; but it is principally supposed to be occasioned by a peculiar state of the atmosphere, during the periods of flowering and ripening. The prevalence of heavy fogs or mist, drizzling rains, and sudden changes in the temperature, have béen assigned; and it has been found that open, airy exposures, are much less affected than low sheltered

lands, in years when mildew prevails most generally. Spring wheat is much less liable to this disease than the Winter species, though it does not always escape. Minute parasitical fungi are commonly detected on the straw of mildewed wheat.

The principal causes of rust are, having the land in too rich a state; a too frequent repetition of the wheat crop, more especially on weak soils, when accompanied by much manure; or the crop meeting a check in its progress to maturity, and in that weakened state being exposed to heavy rains, or variable weather.

Remedies against Rust.—Among the remedies likely to diminish the effects of this fatal malady, it has been particularly recommended to cultivate the hardy sorts of wheat, and to sow early, with a view of having the ear filled before the season is likely to be injurious. But as early sowing is attended with some disadvantages, it would be very beneficial to procure a sort of wheat, either from some foreign country, or raised by selection at home, that would ripen early, without being sown much sooner than the ordinary time.

It is a maxim in husbandry, "*that thick crops are sometimes mildewed, but that thin crops generally are so, in a greater or less degree.*" It appears from a communication in the *Farmer's Journal* (Eng.), that in former times, when four bushels of wheat per acre were sown, the mildew was of much rarer occurrence, than since the practice of thin sowing has been adopted; and there can hardly be a doubt, if the land is in good order, if the crop is sown early, if four bushels of seed are sown, and the wheat is preceded by a green crop, so as to exhaust the pernicious qualities of the dung, that the crop of wheat will not be rusted.

It is also stated on some authority, that the use of saline manures is a remedy against rust. The uses of salt in animal life, prove how beneficial it would be to vegetables. In animals, it is found to promote perspiration, and to prevent corruption in the juices; and consequently it is the most likely means of checking the propagation of fungi, and preventing that rottenness and corruption to which wheat is liable when it becomes rusted. This doctrine is strictly supported by the following facts: rust is seldom experienced in the immediate vicinity of the sea, unless when the ground is greatly over manured; when sea-ooze is employed as a manure, impregnated as it is with saline particles, the crop generally escapes the disease; and that rust is little known in Flanders, where Dutch ashes, *full of salts*, are in use.

A curious and most important circumstance connected with rust in wheat, remains to be stated. In the northern counties of England, where it is the practice to sow what they call *meslin* (blend corn), or a mixture of rye and wheat, it has been there

remarked, that wheat thus raised is rarely infected by the rust. It is singular, that the same circumstance has been observed in Italy. In an account drawn up by the late Professor Symonds, of Cambridge, on the climate of that country, it is recorded as a known but extraordinary fact, "that wheat mixed with rye or tares (for it is a frequent practice there to sow tares with wheat), *escapes unhurt.*" It would appear, from tares being so useful, that the seed of the fungus must be taken up by the root, and that if the root be protected, it is sufficient. This seems to be countenanced by the fact, that thick sowed wheat is less liable to be attacked by the disease; the access of the seeds of the fungi to the root, being rendered more difficult.

Smut.—The smut is a species of degeneracy of the grains in the ear, by which the substance that should form flour in the grain, become entirely changed into a black powder, similar to a puff-ball, or a dusty mushroom. It destroys the value of the seed, renders the flour of a dark colour, which diminishes its price, and some are of opinion that it possesses noxious qualities.

This disease seems to have prevailed in the time of the Roman empire, and is mentioned by Pliny and Columella; yet down to the present day the origin of the evil is not satisfactorily known, though the surmises, and speculations, and experiments, have been without number. Jethro Tull ascribed it to moisture. Duhamel, after recapitulating the different opinions and experiments on the subject of smut, concludes with observing, that smut powder is highly infectious, and recommends leys of lime, saltpetre, alum, verdigris, salt, and wood ashes. Lord Somerville was of the opinion, that the disease was occasioned by an insect. In the course of his researches, he used highly magnifying lenses, and by concentrating the light of the sun on the smut ball, by means of a concave mirror, he discovered that the specks on the ball were real insects, resembling wood-lice in shape. He then conceived, that when the smut powder comes in contact with sound grains, it adheres to them, and inoculates them, so as to render the plant incapable of producing any thing but smut. Linnæus, Walker, and other naturalists, were of the same opinion, that insects caused the smut. Sir H. Davy was of opinion, that smut is produced by a small fungus on the grain, as the products it affords by chemical analysis are similar to those afforded by the puff-ball, and thinks that without the agency of some organized structure, so complete a change could not be effected in the constitution of the grain. Wildenow thought that smut proceeded from a fungus, which multiplied so as to occupy the whole ear. Prevost ascribes it to a microscopic

vegetable of some sort; and Jussieu says, the proximate cause of smut may be attributed to infection of the seed, by the dust of the smut-ball (Lycoperdon). Bauer, of Kew, says the "smut is occasioned by a very minute parasitic fungus, of the genus *uredo*, being absorbed by the roots of the germinating wheat grains, and propelled by the rising sap, long before the wheat blossoms, into the young germen or ovum, where the seeds of the fungi vegetate, and rapidly multiply, thereby preventing not only the fecundation of the ovum, but even the development of the parts of fructification. In consequence, no embryo is produced in an affected germen, which however continues to grow as long as the sound grains do; and when the sound grains arrive at maturity, the affected ones are generally larger than, and are easily distinguished from, the sound ones, by their darker green colour, and from the ova retaining the same shape and form which they had at the time the infection took place."

Remedies.—The preventives of the disease are numerous, and most of them within the reach of our farmers. They are generally such as are calculated to destroy any noxious quality adhering to seed grain, be it the seeds of minute parasitic plants or of animalculæ. Tull has related, that the use of salt brine as a pickle, was discovered by the sowing of wheat steeped in salt water, and which escaped smut, when nearly all the wheat in England was affected. A solution of nitre, copperas, and potash, in the proportion of 8 lbs. to 100 pints of water; arsenic; a decoction of tobacco, hellebore powder, and aloes; a mixture of water, wood ashes, alum, vitriol, and verdigris, boiled for an hour, have all been recommended with confidence. In Norfolk, England, the salt is dissolved in a small quantity of water, just sufficient for the purpose; lime is slaked with this solution, and the wheat is dried with it in its hottest state, having been previously moistened with pure water. In Yorkshire, one ounce of white arsenic, finely powdered, is boiled in a gallon of water for two hours, and stale urine is added to increase the quantity to two gallons, when the wheat is steeped in the liquor, and afterwards encrusted with quicklime. In parts of England and Scotland, stale urine, free of any mixture, is generally used; and in a practice of forty years, Messrs. Culleys used this preparation, and never had any smut. Mr. Donaldson made sixteen experiments with seed impregnated with smut powder, and sowed some without any preparation, and the residue steeped in preparations of arsenic, vitriol, chamber ley, and lime. That sown without preparation was one-half and five-sixths (being two parcels) smutty, while that steeped in chamber ley and limed had but one smutty ear in forty-six. Mr. Bauer expresses a strong conviction, from repeated experiments, that steeping the seed in pro-

perly prepared lime water, for at least twelve hours, and then to dry it well in the air before sowing it, is the surest way to prevent smut.

It is the practice of many of our farmers, to steep the seed grain in lime water, and though it does not wholly prevent smut in all cases, it certainly has a highly salutary effect in lessening the evil. It has been our practice, says the writer of the foregoing, to steep the seed twelve hours in salt pickle, and then incrust with quick-lime; and when we have adopted this course, no smut has been perceptible. Wherever experiments are made with steeps, it is well to sow a quart or two of seed without any preparation, the better to test the benefits of the steep.

A very sensible writer in the Penny Magazine, F. Bauer, has written several communications upon the diseases of wheat and other grain, which contain the result of close and continued examination, and are accompanied with drawings showing the appearance of the diseased grain, and of the fungi and insects which cause these diseases. He considers the smut of grain a parasitic plant or fungus, whose seeds are so minute as to pass from the seed grain in the soil, with the ascending sap, to the ear of the grain, where it grows and produces smutty grain. His preventive is to steep the seed in strong lime water, which he supposes kills the seed of the smut. There is no doubt, that the steeping and liming seed wheat is a sure remedy against smut. Thousands of trials, made in this country and in Europe, leave not a doubt upon this subject.

We would particularly caution all farmers, to use fresh burnt lime, where practicable. Lime long exposed to the atmosphere loses in a great degree its causticity; by absorbing carbonic acid, it is restored to the state of limestone or chalk, and its alkaline qualities are completely neutralised.

Worms and Insects.—The injuries which crops sustain from worms and insects, are often very great. The writer mentioned in the last article, Mr. Bauer, has made another communication on what he calls the *grain worms* (*vibrio tritici*), which is accompanied by drawings of the diseased grain and of the insects, as they appeared under a highly magnifying power. The disease is known in England under the different names of *ear-cockle*, *brown-purple*, and *burnt-corn*. Mr. B.'s experiments and observations were commenced in 1807, and were continued down to 1823, at which time he communicated a detailed account of them to the Royal Society, which may be seen in the Philosophical Transactions of the latter year. We do not feel competent to decide, whether the grain worms described by Mr. Bauer are the same as those which attack our wheat, but we are inclined to the

opinion that they are identical. We subjoin an extract from Mr. B.'s communication, which cannot fail to interest the farmer as well as the naturalist.

"Being fully convinced that the worms or their eggs, like the seeds of the pepper-brand and the dust-brand (smut), must be absorbed by the germinating seed corn, and propelled by the circulating sap into the young germens, and reflecting that I had successfully inoculated the wheat grains with the fungi, I determined to try the same experiment with the worms; accordingly I selected a sufficient number of sound wheat grains, and extracting a small portion of the worms from the cavities of the infected grains, (which had been previously soaked in water about an hour,) and placing some in the grooves on the posterior sides of the sound grain, I left them for some days to get dry, and planted them in the ground on the 7th October, 1807. At the same time I planted some sound wheat grains in separate holes, about two inches deep, and in each hole two or three infected grains also. About the middle of November most of the seeds had come up, and from time to time I took some of these young plants for examination, but did not perceive any effect of the inoculation until the 3d of December, when, out of nine plants, five appeared to be infected with worms. In the first plant, after carefully splitting the young plant from the root upwards, I found in the unorganized substance, between the radicle and plumula, three young worms very lively, but not much larger than those with which the seed corn was inoculated; in another plant I found one full sized worm, but no eggs about it; in the third plant I found a still larger worm than the last, but in dividing the stem I had cut the worm in two, and it soon died; it seemed to be full of eggs; in the other two plants I found some worms quite young, and some half grown; but on the other four plants the inoculation had no effect. The fact, that at such an early stage of the vegetation of these inoculated seed grains, such large worms should have been discovered, fully confirms my original supposition, that it requires several generations of these worms to introduce their eggs into the young germens: the large worms found in the substance of the young stem were undoubtedly some of the worms with which the seed corn was inoculated, for they were on the point of laying their eggs in that stage, and these eggs, being again propelled by the rising sap a stage further, there come to maturity, and then lay their eggs, and thus progressively reach the elementary substance of the ear, where they are finally deposited in the then forming grain; the whole progress probably requires three or four reproductions."

Mr. B. then describes many subsequent examinations on infected plants, and continues:

"My experiments for resuscitating the grain worms, I have repeated almost every succeeding year to this day, and always with the same success; but I find that the longer the specimens are kept dry, the grains require to lay in water a greater length of time before the worms will recover; and that after the same specimens had been kept dry *six years and one month*, the worms were all really dead.

"That this disease is contagious, is sufficiently proved by the fact, that it can at pleasure be successfully inoculated on the soundest seed corn. The infection, however, is not so generally nor so readily communicated, as the disease occasioned by the fungi of the smut balls or dust brand, a few infected ears of which, are capable of contaminating and infecting the whole contents of a barn. Grains infected with these worms have no embryo, cannot vegetate and produce again diseased grains of themselves, but can only communicate the infection by coming in contact with the germinating seed corn in the soil, by the moisture of which the worms are revived and extricate themselves, which I have so often observed they do when kept some time in water.

"Steeping the seed corn in lime water, in the same manner as advised for preventing the diseases occasioned by the fungi, is the most effectual method of preventing the spreading of this disease. I have repeated the experiment by inoculating, very strongly, sound wheat grains with the worms, and afterwards steeping them in lime water, and the infection was always prevented; I have also steeped some sound wheat grains in lime water, and after having kept them in a dry state for some days, I inoculated them strongly with the worms, but on examining the plants not one case of infection occurred. From these facts it is evident, that properly steeping the seed corn in lime water before sowing, is a sure preventive of the disease occasioned by grain worms."

Beside the *worm*, wheat is often very seriously injured by a *fly*, called the wheat fly, a species of which is sometimes called the Hessian fly. The wheat fly generally makes its appearance about the end of June, and according to the observation of some, are said to exist throughout a period of thirty-nine days.

The ravages of the Hessian fly have now greatly abated, though it is present more or less from time to time. This fly deposits its eggs in the Winter wheat, in which state it remains until the plant has acquired some growth; the grub then feeds upon it, and the plant having its nourishment intercepted,

sickens. In the Spring it assumes the perfect form, as soon as the weather is moderately warm, and immediately proceeds to deposit its eggs in the Spring wheat. Wheat grown on highly cultivated land is not much injured by this fly; but the entire crop of Spring wheat, grown on poor land, is often destroyed by it.

No individual, probably, has done more to investigate this subject, and find a remedy for the evil, than Mr. Worth; and in a communication made to the Pennsylvania Society in 1823, we find a detail of his indefatigable labours. In that communication, Mr. Worth details the material facts in regard to the Hessian fly, and recommends a change in the course of crops as the most effectual remedy, viz.: break up for wheat, follow with corn, and then oats and grass seed, *ploughing and harrowing the stubble immediately after harvest, and a second time before May*, by which a great number of insects will be destroyed in the pupa state, and volunteer plants will throw up to receive the deposits of those which escape. Where pasturing is resorted to, he says the work must be completed in a few days, and immediately after the deposit; and that even then it may be a dangerous expedient, unless on strong grounds, and in a favourable season.

The best remedies seem to consist of a good tilth; a rich, but not wet soil; late sowing; ploughing in the stubble immediately after harvest; and perhaps feeding off the crop in the Spring, with sheep or other light-footed stock.

It has also been recommended to sow powdered caustic lime upon the crop, while the insect is in the egg, or caterpillar on the blade of the wheat, or even when it has descended within the sheath.

In a case mentioned in the Memoirs of the Board of Agriculture, two bushels of lime were sown upon an acre of wheat infected by the fly, *while there was a heavy dew upon the ground.* Two other acres, the same quality of ground, on which wheat was sowed at the same time, were left to their fate. The limed wheat gave a good crop, the other not more than half a crop.

CHAPTER XI.

CULTURE OF RYE.

Rye, according to some, is a native of Crete; but it is very doubtful whether any country can now be ascertained to be its native soil. It has been cultivated from time immemorial, and is considered as coming nearer in its properties to wheat, than any other grain.

The *varieties* of rye are not above two, known as Winter and Spring rye; but there is so little difference between them, that Spring rye, sown along with Winter rye, can hardly be distinguished from it.

The *soil* for rye, may be inferior to that chosen for wheat; it will grow on dry sandy soils, and produce a tolerable crop; and on the whole, it may be considered as preferring sand to clays.

This grain, though of the same family with wheat, is less valuable. A bushel of rye weighs less, and gives less flour, and of worse quality, than a bushel of wheat. In comparison, therefore, with wheat, it fails; still there are circumstances, which, as an object of culture, may give it the preference; 1st, it grows well in soils where wheat cannot be raised; 2d, it bears a much greater degree of cold than wheat; 3d, it goes through all the phases of vegetation in a shorter period, and of course exhausts the soil less; 4th, if sown early in the Fall, it gives a great deal of pasture, without much eventual injury to the crop; and 5th, its produce, from an equal surface, is one-sixth greater than that of wheat. These circumstances render it peculiarly precious to poor soils, and poor people—to mountains of great elevation, and to high northern latitudes.

Its use, as a food for horses, is known as well in this country as in Europe. The grain chopped and the straw cut, forms the principal horse feed in Pennsylvania.

The species of this grain, cultivated here, are two; the *black* and the *white*; for Spring rye (often mistaken for a *species*), is but a *variety*, produced by time and culture, and restored again to its former character and habits, by a similar process.

According to the course of crops, detailed in a former part

of this work, potatoes, in a sandy soil, precede rye. The ploughing, harrowing, and manuring given to *that* crop, will therefore make part of the preparation necessary for *this*. After harvesting the potatoes, cross plough the ground and sow and harrow in the rye, taking care, as in all other cases, that the seed be carefully selected and thoroughly washed in lime water, as the means best calculated to prevent the *ergot*—a disease to which it is most liable, and which is supposed to be an effect of too great humidity.

John Keely, of Haverhill, in Mass., in 1832, made a successful experiment in the cultivation of rye, by ploughing in three crops of weeds which grew spontaneously on the ground before sowing the seed. The product of the ground that year, being an acre and thirteen rods, procured him the first premium offered by the Essex Agricultural Society, for the cultivation of rye. The soil on which this crop was raised, was sand approaching to loam. In detailing the experiment, he says, that "in the Summer of 1827, we sowed three bushels of Winter rye near the river, on about two acres of land, which produced twenty-eight bushels.

"In 1828, we sowed 4 bushels on four acres of land running the whole extent of the plain from the river. This piece was sowed in the Spring with oats; but the oats were completely smothered with charlick, and about the middle of June, the whole crop was mowed to prevent the charlick seeding. By about the middle of August, a second crop of charlick having covered the land, it was ploughed very carefully, in order completely to bury the charlick; and then suffered to remain until the 15th of September, when we began sowing the rye in the following manner. A strip of land about twelve yards wide was ploughed very evenly, to prevent deep gutters between the furrows, and the seed immediately sown upon the furrow and harrowed in. Then another strip of the same width, and so on until the whole was finished. We found the oat stubble and charlick entirely rotted, and the land appeared as if it had been well manured, though none had been applied to this part since it had been in our possession. The rye sprung very quick and vigorously, having evidently derived great benefit from being sown and sprouted before the moisture supplied by the decaying vegetable matter in the soil had evaporated to any considerable extent. This crop produced 133 bushels.

"In 1829, the charlick was suffered to grow on the land appropriated to rye, until it had attained its growth and was in full blossom. The land was then ploughed very carefully, and the charlick completely covered in. In a short time, a second crop appeared, more vigorous than the first. This also was allowed

to attain its growth, and then ploughed in as before. A third crop soon appeared, which of course was destroyed, when the land was again ploughed for sowing about the middle of September. This piece of land was a parallel strip running from the river, and containing two acres. Two bushels of rye were sowed. The crop presented a remarkably promising appearance, and yielded seventy-four and a half bushels.

"In 1830, the land appropriated to rye included nearly all the lighter part of the soil, and owing to a pressure of business was not attended to as we could have wished. It was ploughed in the early part of the Summer. But harrowing to destroy the weeds was substituted for the second ploughing. This, and the unusual blight which affected all the grain in this part of the country, led us to anticipate a small crop. It yielded, however, fifteen bushels to the acre.

"The land on which the crop of rye was raised the present season, had for three or four previous years been planted with Indian corn: and owing to the extent of our tillage land, we have not been able to apply more than four or five loads of manure to the acre this season. The charlick was suffered to attain its growth as usual; and on the 18th and 19th of June it was carefully ploughed in. The second crop was ploughed in on the 6th and 7th of August. On the 14th and 15th of September it was sowed in the usual manner, namely, a small strip of land was ploughed, and the seed sown immediately upon the furrow, and then harrowed in. Then another strip of land was ploughed, and so on till the whole was completed. One bushel per acre was sowed as usual. The seed was originally obtained from a farmer in this vicinity, and I suppose is similar to that which is generally used. We have never prepared our seed in any manner, but have directed our attention solely to the preparation of the land; and to this we attribute our success. Owing to the unusual severity of the Winter, the crop was considerably Winter killed, but recovered very soon in the Spring, excepting in the midfurrows. There, as the land lies very level, the water settled, and so completely destroyed the rye, that they continued bare the whole season. This would of course cause some diminution in the crop; perhaps a bushel or two. The rye was reaped at the usual season, and, as the weather was favourable, immediately put into the barn. The land contained one acre and thirteen rods, and yielded *forty-six bushels and three pecks.*"

Rye may be raised for many years in succession, on the same ground, without materially exhausting the soil, particularly if it be perfectly suitable to the growth of this grain, and provided also that the stubble be turned under immediately after taking off the crop.

Whenever the straw of Winter rye becomes yellow, shining and flinty, and circulates no more juices, nature makes the signal for harvest, and no time should be lost in obeying it.—"*Cut two days too soon, rather than one day too late*," was among the precepts of Cato; which, if adopted here, would save much grain—terminate the harvest about the tenth of July, and give abundant time to turn down the stubble, and sow the crop next in succession.

DISEASES.—Rye is not exempt from the attack of insects; but suffers less from them than either wheat or barley.

The spur or ergot of rye, is by some considered as a fungus somewhat analogous to that which produces the smut. It is not peculiar to rye, but it is very seldom found on any other gramineous plant. It is a production of the seeds; is long, horny, and cartilaginous, and is sometimes straight, at others curved; sometimes it is found more than two inches in length. The resemblance of this substance to cock's-spur, has given it the name by which it is distinguished. On breaking a spurred seed, you find within it a substance of a dull white colour, adhering to the violet skin that surrounds it. Rye thus attacked cannot germinate. It has been remarked, that the most rainy years were the most productive of this disease; that the soils on which most spurred rye grew, were most moist; that high grounds were nearly free from them, unless when the furrows prevented the water from running freely off; while the lower parts of the same field produced more than the upper parts.

This spur when ground down into flour, or used in distillation, is considered to communicate to the flour or liquor, a poisonous quality, exceedingly injurious and often fatal to health.

CHAPTER XII.

CULTURE OF BARLEY.

It is not known of what country barley is a native. Some assign it to Tartary, others to Siberia, and even Scotland has been mentioned. It has been cultivated from the earliest antiquity, and was much in use among the Romans, both as food for soldiers and horses. In Sweden and Lapland, it is more cultivated than any other grain, on account of its requiring to be so short a period in the soil: sometimes not longer than six weeks, and seldom more than seven or seven and a half. In Spain and Sicily, they have two crops a year on the same soil; one is sown in Autumn, and ripens in May; and the other is sown in May, and ripens in Autumn. In Britain it is a tender grain, and easily hurt in any stages of its growth, particularly at seed time.

The *soil* for barley should be such as will grow good turnips or other green crops, including clovers, and which embrace the varieties of loams and sands that are not wet, or *very* dry and poor. Barley cannot be cultivated to advantage upon stiff, heavy, and wet grounds, or on such as are of a cold and tenacious quality. This crop occupies the ground but about three months; and it is only in a dry, light, mellow soil, that its roots can extend with sufficient facility, and supply the food necessary to bring the grain to rapid and perfect maturity.

Previous crop.—Crops that precede this grain, should be such as leave the ground mellow, and free from weeds; and for this reason hoed crops are to be preferred, such as turnips, potatoes, peas, beans, &c. Small grains should not precede it: they impoverish the soil, leave it foul, and besides, it is contravening one of the most salutary maxims of husbandry, to grow two dry crops in succession. It may follow clover; but if the soil is heavy, the ley should be ploughed in Autumn. Barley is successfully sown upon the fallows in England, (not Summer, but Autumn fallows,) and is sown sometimes after wheat; but in the latter case, turnips are pulled and previously fed upon the stubble—a practice which, says Judge Buel, the author of these

remarks, is not likely to obtain here. I have generally sown barley after ruta baga or potatoes, these crops having received a good dressing of long yard or stable manure.

Manure should not be applied to the barley, but to the preceding crop. The short period that this grain occupies the ground, does not afford time for the manure to decompose and yield its food to the plants; and if applied in excess, it causes a too rank vegetation, and the straw lodges before the grain is matured. Where a fallow or clover ley is employed, and ploughed in Autumn, dung may be previously applied and ploughed under.

Preparation of the ground.—Where barley follows a root or hoed crop, one ploughing will generally suffice: but in all cases a complete pulverisation of the soil is necessary; and to effect this a roller is often of material benefit. If sown upon grass leys, ploughed in Autumn, the Spring ploughing should be shallow, so as to leave the sod reversed. But the preferable way may be to harrow the fallow, plough in the seed with a light furrow, and smooth off with the harrow.

The seed and sowing.—Loudon enumerates six species and sub-species of the barley. The kinds uniformly cultivated here are the two, four, and six rowed Spring, (*hordeum vulgare, and h. distichon.*) Thin skinned, pale, plump seed, should be selected, and sown as soon as the ground is sufficiently dry in Spring. The young grain is not hurt by the ordinary frosts of the latter part of April and May. Sow from six to eight pecks per acre, according to the richness of the soil and the forwardness of the season; the poorest ground and the latest sowing requiring the most seed. In England, the common quantity of seed is from eight to sixteen pecks. Our climate being much warmer than that of Great Britain, barley and other grains till better with us, and consequently we require less seed. We uniformly sow broadcast, generally on the fresh furrow, and harrow in both ways; and those who have a roller, use it in the finishing operation. It gives a smooth surface, breaks down the lumps, brings the earth in contact with the seed, and if grass seeds have been sown, its use is doubly beneficial. Steep the seed twenty-four hours in a weak solution of nitre, the crude kind of which costs about eight cents per pound, by the quantity. From the analysis and observations of Grisenthwaite, there is reason to believe that this salt is peculiarly beneficial to the barley crop, the grain yielding it on analysis. The powdered dung of pigeons and dunghill fowls, at the rate of twenty to thirty bushels the acre, has been applied to this grain as a top dressing, with singular success.

This crop admits of no after culture when sown broadcast. Yet the application of the roller, when the plants are two or three inches high, is no doubt salutary, especially if there has been no considerable rains. Rolling gives a salutary compression to the soil, which in the Spring is apt to be loose and porous, and full of cracks, by the alternation of freezing and thawing, or of wet and dry weather; it destroys many insects; and, above all, it partially buries the crowns of the plants and induces a multiplication of seed stalks, which has been proved from practical experience. When grass seeds are sown with barley, the luxuriance of the young grass sometimes chokes the grain, robs it of nutriment, and sensibly diminishes the product. To obviate this evil, it has been recommended to sow the grass seeds after the barley has come up, and to cover them with a harrow and the roller; and it is said, and I think with truth, that this operation will not materially injure the grain. In dry seasons, the crop is sometimes attacked by worms, while young. In this case the roller should be applied, and sufficient weight added, to require the draught of two or three cattle.

Time and method of harvesting.—When the soil is rich, and the season propitious, this grain is very liable to lodge. If this happens after it has blossomed, no material injury is sustained in the product. If before, the crop is greatly diminished. This shows the danger to be apprehended from making the soil too rich, and of applying fresh manure. Barley is known to be ripe by the disappearance of the reddish cast on the ear, or what the English farmers term *red roan*, by the ears beginning to droop and bend themselves round against the stems, and by the stalks becoming brittle and of a yellowish colour. This is the particular period for cutting, as if suffered to stand longer, the heads break off, and the grain wastes, with the slightest touch. And it may be cut with the cradle, sickle, or scythe, according to circumstances. If it stands straight, and is not too heavy, the cradle is to be preferred; if heavy, or lodged, the sickle or scythe. But, as the grain is yet soft, and the straw contains much moisture when it ought to be cut, it should be suffered to become well dried in the swathe before it is bound in sheaves, or carried to the barn or stack. If cut with the cradle or sickle, it is bound in sheaves; but the more common practice is to cut the crop with the scythe, rake the ground, and load it with the barley fork.

Barley improves for malting by lying till October before it is threshed; though it is often threshed immediately from the field. The great difficulty in preparing it for market, is to rid it of the awns. This may be done with flails after it has passed

once through the fanning mill. And where it is in great quantities, it may be spread from four to six inches upon the barn floor, and trodden with horses.

Produce and profits.—The average product in England is stated by Donaldson at thirty-two bushels per acre. The product in New York varies from fifteen to seventy bushels, according to season and soil; and I think the average is somewhat short of that of Great Britain. Compared with wheat, its product is as two or two and a half to one; compared with oats, about equal, provided the soil is adapted to this grain. It is, however, to be remembered, that neither wheat nor oats are adapted to a barley soil; the first requiring a more stiff and tenacious, and the latter a more cold and moist location. The average price of barley is at least two-thirds that of wheat: supposing wheat to be $1 12 cents the bushel, and the product 15 bushels per acre, and barley to be 75 cents, and the product of an acre 30 bushels, and the expense of cultivation equal, the profits of the barley will be nearly as three to two compared to wheat. Barley, besides, is a less precarious crop.

The *uses* of barley are various. In Wales, Westmoreland, Cumberland, and in the north, as well as in several parts of the west of Scotland, the bread used by the great body of the inhabitants is made chiefly from barley. In England, large quantities are converted into beer, ale, porter, and spirits, and it is applied to the same use here.

The *diseases* of barley are few, and chiefly smut, but of quite a different species from that which affects the wheat, and one which it is found cannot be prevented by pickling and liming.

CHAPTER XIII.

CULTURE OF OATS, MILLET, AND BUCKWHEAT.

The oat is a very useful grain, and more peculiarly adapted for northern climates than either wheat, rye, or barley. Of all grains it is the easiest of culture, growing in any soil that admits of ploughing and harrowing.

Of the many different species or varieties of this grain, the *black* and the *white* are those which best deserve cultivation, because most hardy and productive. In the poorest soil, and with the smallest possible labour, they give something; and, contrary therefore to the natural inference, they are not great exhausters of the soil. Mr. Dranus has made a series of experiments and calculations, which demonstrate, that "oats, in rotation, under proper culture and in good soil, are not less profitable than wheat or rye; that after beans, cabbages, or potatoes, it yields great crops; and that it exhausts less than other grains, which occupy the soil a greater length of time." As a protector of clover and other grass seeds (and with it some of these should always be sown), it is second only to barley.

The soil for oats may be any kind whatever, from the stiffest clays to moss or bog, provided it be laid sufficiently dry. The most tenacious clays, and meagre gravels and sands, where scarcely any useful seed-bearing plant except buckwheat could be grown, will produce a crop of oats, if ploughed at a proper season, and the seed judiciously sown and covered.

Oats succeed best upon strong moist soils, which are not exactly suited to wheats, and will do very well with less cultivation than is proper for grains. Two good ploughings upon grass land of this description, fit them to receive the seed, which is sure to succeed well if it receives a thorough harrowing. The best kind known in this country, is considered to be the potato oat, which has a handsome short plump kernel; but this kind appears to degenerate, in spite of ordinary attention. At present, the crops of potato oats have lost that distinguishing character, though the peculiar berry is still observable; by selecting the finest heads in a field, and sowing them apart, and continuing to do so for

three or four years, a fine seed might no doubt be re-produced. —The usual quantity of seed sown to the acre is two bushels, which by many experienced farmers is not judged enough.

The quantity of seed for a crop of oats, is generally from three to four bushels to the acre, though some farmers have gone as far as five or six. The amount must depend upon the richness of the soil, and the variety that is cultivated. The potato oats require much less seed than the other sorts, and may be safely trusted, when the land is equally well cultivated, with as small a quantity of seed as barley, namely, from two to four bushels. It is, however, to be observed, that as oats in general are cultivated on weak and inferior soils, and in cold climates, the quantity of seed should be increased in proportion as these circumstances operate.

The season of sowing oats, is from the last week in February to the end of April, though in most climates it is best to sow as early as the ground can be properly prepared in the Spring. No preparation is ever given to the seed, but it should be fresh, plump, and free from the seeds of weeds.

Oats are not often the subject of disease. Sometimes it is found to be attacked by the smut; but the more common injury sustained by oats, is from wire worms or larvæ of insects, which generally abound in lands newly broken up from turf. One of the most certain modes of avoiding these is, by not ploughing the ground, especially if old turf, till immediately before sowing. By this means the insect is turned down; and before it can work its way to the surface, the plant is beyond its reach.

MILLET.—Some of our agricultural publications speak highly of the cultivation of millet, as a fodder for cattle. But as its reputation may not yet be fully established, we add what follows on this subject, more with a view to place it before the reader for trial or experiment, than with any design to recommend it.

In the Memoirs of the Board of Agriculture of this state, is an extract from a communication by J. H. Powell, Esq. of Philadelphia county, on millet fodder.

"I have made," says he, "many experiments on various soils, and at different seasons, to ascertain the product, as well as the properties, of millet. Upon light land in good condition, it succeeds best. It requires in all cases fine tilth, and as much strength of soil as is necessary to produce heavy oats. I have not seen in Europe or America, any green crop which so largely rewards accurate tillage, and plentiful supplies of manure, as the species of millet usually grown in this and the adjacent counties. (This species is the "*Panicum Italicum*" described in Rees' Encyclopædia.) I have sown it from the first of May

to the twentieth of June, and have invariably obtained more fodder than could have been obtained from any grass, under similar circumstances. In the Autumn, eighty bushels of caustic lime per acre, were strewed upon an old sward, which was *immediately* ploughed, closely harrowed, sowed with rye, and rolled. The rye was depastured in the Winter and succeeding Spring; early in April the land was ploughed again; the lime and decomposed vegetable matter were thus returned to the surface; about three weeks after it was harrowed to destroy weeds; early in May it was again harrowed for the same purpose; within a fortnight it was stirred with Beatson's scarifier, to the depth of nine inches, harrowed, sown with millet, and rolled. The crop was fairly estimated at three tons per acre;—after the millet was cut, the field was stirred and repeatedly harrowed, to destroy the after growth of noxious plants. I intended to again sow rye, not only to obtain pasturage, but to protect the soil from the exhalation of the sun. In the succeeding Spring a slight dressing of fresh manure was ploughed under; the scarifier, roller, and harrow were used at intervals, as before. On the fifth of May, five bushels of millet seed were sown on four acres; on the fifth of July the crop was hauled, and estimated at four tons per acre. I have obtained this season, forty tons from sixteen acres, of which four only had been manured; the remainder could not have borne a good wheat crop. One of the loads was weighed; an account of them was regularly kept, and their size was made as nearly equal as possible. I have generally used a large quantity of seed, as not more than two-thirds of that which is sown usually vegetates. Whilst my oxen consumed millet in its green state, they performed their work with more spirit and vigour, than they had done before, or have shewn since, except when fed with grain. My cattle of all ages, prefer it to both red and the best white clover, meadow or timothy hay.

"I am not disposed to cultivate millet as a farinaceous crop, since I have found found great difficulty in protecting it from the ravages of immense flocks of birds, which it attracts, and in securing it sufficiently early to prevent a large part of the grain from being left on the ground. The seeds on the upper part of the stalks, generally ripen and fall, before those below have filled. I therefore invariably cut it when the upper parts of the most of the heads contain seeds which are hard. All my observations have convinced me in the belief, that in this stage it affords fodder more nutritious, and more easily made, than any sort of hay.

"The expense of tilling land in the accurate manner which I have detailed, is not so great as at first view would appear. A

yoke of good oxen can scarify three acres and a half, without difficulty, in one day.

"I would recommend millet not merely for its value as food, but for the means it affords of making clean the land, without summer fallows or drill crops. Deep ploughing at proper seasons, is, I conceive, the basis of all good farming. Such crops as shall enable the husbandman to extirpate weeds, and obtain large supplies of fodder, without much exhaustion, should be the great object for his aim.

"I would propose that a foul sward receive its proper quantity of quick lime, which should be spread and ploughed under, in its *caustic* state, in the early part of September; that the field be harrowed sufficiently; sown with rye at the rate of two bushels per acre as early as possible, that it be depastured late in the Autumn, and early in the Spring; that in May it may be again ploughed three inches deeper than before; that it be harrowed and left until the small weeds begin to appear; early in June, millet should be sown; in August the crop can be removed, after the labours of the general harvest. The field should be slightly stirred with the scarifier, occasionally harrowed, and left throughout September, for the destruction of weeds as before. In October it may be manured, and sown with wheat, or left for a crop of Indian corn."

BUCKWHEAT.—In the culture of buckwheat the soil may be prepared in different ways, according to the intention of the future crop, and for this there is time till the end of May, if seed be the object, and till June, if it be to be ploughed in. It will grow on any soil, but will only produce a good crop on one that is tolerably rich. It is considered one of the best crops to sow along with grass seed.

The season for sowing cannot be considered earlier than the last week of April, or first of May, as the young plants are apt to be destroyed by the frost. Some writers say it should not be sown till the middle of May, or until the first of July.

The mode of sowing is always broadcast, and the quantity of seed from three pecks to a bushel per acre; it is harrowed in and rolled, and requires no other culture than pulling out the large weeds, and guarding from birds till the reaping season.

Buckwheat is harvested by mowing in the manner of barley. After it is mown, it must lie several days, till the stalks are withered, before it is housed. It is in no danger of the seeds falling, nor does it suffer much by wet. From its great succulency, it is liable to heat, on which account it is better to put it in small stacks of five or six loads each, than in either a large one or a barn. It is better when it has lain a few days to dry,

tons only per acre) to amount to five hundred and sixty bushels, each of eighty pounds weight.

He recommends the planting of whole potatoes, and those only which are of fine medium size—none to be of less weight than four ounces; and he often prefers those which weigh six or eight ounces. The earlier sorts, and, indeed, all which seldom attain a greater height than two feet, are to be planted about four or five inches apart in the rows, centre from centre, the crown ends upward; the rows to be from two feet six inches to three feet asunder. The late potatoes, which produce a haulm above three feet in height, are to be placed five or six inches apart, centre from centre, in rows four or five feet asunder.

When potatoes are thus planted in rows pointing north and south, the utmost energy of the light will be exerted, not only upon the foliage of the plant, but upon the surface of the intervening spaces of ground. If we suppose that the main crops will be planted at the latter end of March, and during the month of April, the sun's meridianal altitude will be advancing daily, for nine weeks: and during that period, the developement and growth of the stem and leaves will be in a state of rapid progress. After the turn of days, and when the plants have attained their full growth, the sun will continue its most powerful influence. Should the ground be of a proper texture and quality, the plants will stand erect, and the maturing process will proceed without interruption; and after favourable Summers, wherein there have been regular and moderate supplies of rain—particularly during May and June, with a prevalence, however, of bright sunshine, the crops of potatoes will be regular, the tubers generally of a medium size, and the quality mealy, and altogether superior. If the soil be a strong mellow loam, enriched wtth much manure, the haulm will, in all probability, grow too rank, and finally fall over; nevertheless, the large spaces between the rows will greatly remedy this evil, for the sun's beams will act upon one surface at the least, and the matting and other injurious consequences resulting from close drilling, will be prevented or obviated.

The *soil* ought to be sandy and light, though moderately rich; that is, if fine mealy and dry potatoes be required. It should not by any means be glutted with manure, and need not be deep. And there has not been found any particular advantage in trenching for this crop; in fact, the finest potatoes are produced in extraordinary quantities upon grass meadows, by simply turning up the turf, and placing the grass surface downward upon them.

Sweet, or Carolina Potato.—The following on the culture of the sweet potato, is from Mr. Williams, published in Goodsell's Farmer.

"I have noticed in several numbers of your paper some observations on the cultivation of the sweet potato, none of which meet my ideas of the correct mode. Having lived a number of years in the state of Georgia, and being conversant with the cultivation of that vegetable experimentally, I am induced to give you some observations adapted to this climate, which if followed, I am persuaded will be attended with full success.

"About the 20th of March make a hot bed in the usual form about four feet square, in which plant your sweet potatoes about three inches apart; let them be treated as hot bed plants during the month of April, keeping on the sash, and no matter how irregularly compressed within the frame, provided they are kept warm and in a growing state.

"About the first of May, take a piece of ground well ploughed and prepared, make hills about three feet apart in the row, and the rows about three and a half or four feet apart, then take off your sash from the hot bed, and cut the vines about twelve inches from the root, leaving the root in the bed; remove the vine to your prepared ground, and cut them into lengths about fifteen inches long; take one piece of the vine, wind the middle about the fingers so as to leave both ends out, plant the middle about three inches deep, leaving the ends about two inches above the ground, to each hill about five pieces of vine in open order: in about ten days they will have taken root, and about the first of November will have filled the hills with large potatoes.

"Then take the seed potatoes out of the hot bed and plant one or two in the middle of each hill, not in the same hills where the vines are placed, but in separate hills. About the middle of June the vines will have run a considerable distance, when they may be cut again and planted in a similar manner in hills freshly prepared for seed the next year. By this method the southern planters often raise from four to five hundred bushels to the acre from the first planting, of large and fine potatoes for use, and from the last planting, which is usually done by them about the first of August, they get a plenty of small ones for seed which they call slips. It is very rare they plant more than a quarter of an acre with seeds, depending chiefly on planting the vine, which if done by the 10th of June, is pretty certain to yield a large crop, and will furnish vines sufficient to plant at least five acres.

"To keep them over Winter, or for any length of time for use, they should be packed in such manner as not to touch each other, being very liable to heat like corn, and kept secure from frost. As good a way as any is to set them about half an inch apart covered with dry sand, in a warm, dry cellar.

"By observing the above directions, I have no doubt they may be raised with great success in this climate. A sandy soil

or loam is best adapted to their cultivation, but any dry muck soil will answer very well."

THE TURNIP.—The *varieties of turnip* grown by farmers, may be arranged as whites and yellows.

Of *white turnips*, by far the best and most generally cultivated, is the globe; but there are also the green topped, having the bulb tinged greenish; and purple topped, with the bulb reddish; which though they do not produce so large a crop as the globe or oval, stand the Winter better, and the red topped, it is said, will keep till February. The pudding or tankard turnip, has a white bulb which rises from eight to twelve inches high, standing almost wholly above ground. It is less prolific than any of the others, and more liable to be attacked by frost.

Of *yellow turnips*, there are the field or Aberdeen yellow, more hardy than the globe, and answers well for succeeding that variety in the Spring; and the ruta baga or Swedish turnip, which may be preserved for consumption till June.

Although turnips here do not readily stand out the Winter, yet, if they are drawn when the soil is dry, topped and tailed, and put into heaps and covered with straw and six inches of earth, they will resist the most rigorous Winters. A few on the north side of the heaps will be frozen, but they are not of much less value on that account; and the rest will generally be as fresh as when they were put in.

Soil.—The soil for turnips should always be of a light description. In favourable seasons very good crops may be raised on any soil; but from the difficulty of removing them, and the injury which the soil must sustain either in that operation, or in eating them on the spot with sheep, they never on such soils can be considered as beneficial to the farmer. Turnips cannot be advantageously cultivated on wet tenacious soils, but are grown on all comparatively dry soils, under all variations of climate.

Turnips may be successfully raised upon new land, by broadcast sowing, but the plants should be hoed out, at least a foot apart, if they are intended to come to any growth. Good crops may also occasionally be got from reclaimed swamps, where the vegetable mould is sufficiently mellow, but as to the regular cultivation of turnips upon old land, it cannot be carried on without manure, and particularly the Swedish turnip, which, to become a fine crop, must have abundance of food itself, but this it amply repays.

Field culture.—The ground being placed in a mellow state, should be well manured, spread very evenly on the surface, covering every part of it, and ploughed in about the 20th of June. After this it is to be harrowed well down, and then ploughed into

small ridges about 30 inches apart, and certainly not wider than three feet. Some persons plough the ground in this manner before manuring, and then when the manure is evenly spread on the surface, rake it into the furrows, and then convert them into ridges covering the manure. Swedish turnips exhaust a great deal of manure, and by this method it will extend further, which is an object where manure is scarce. But where there is no occasion for such economy it is better to spread the manure before making the ridges, and to cover every part of the land to a palm of the hand with it.

About the middle of June, let the Swedes be sown after this preparation with a drill harrow, moderately thick. As soon as the turnips are in the rough leaf, let them be separated by expert hands with hoes to about the distance of eight inches apart, killing at the same time all the weeds on the top of the ridges. When the turnips have become well fixed again, for many must be loosened in this operation, and the sides of these ridges are covered with weeds, introduce a small plough, and take a slice from both sides of every ridge close to the turnips; these slices of course fall into the furrow, carrying the weeds which grew on the sides. A day or two after in dry weather, another plough with a double mould board is introduced into the furrow, and sweeps back the mould to its place. This operation may be repeated as often as the weeds appear; but if it is effectually done once, it will not be wanted again, though a repetition will do the crop no harm.

About the 13th of July the white turnips may be sown, and treated in every circumstance from the beginning to the end as directed for the Swedes. Nothing can look more beautiful and fresh in the months of October and November, when grass is upon the decline, than fields of turnips with their ample, green, and flourishing tops. Nor can any crop be more ample than the turnips themselves. It is almost incredible the quantity which in favourable seasons may be grown upon an acre.

"By this method of culture," says Mr. Featherstonhaugh, (Mem. Board of Agr.) "I have within the last ten years, had some crops so very productive, that I have found it difficult to persuade some of my farming friends that so many turnips could grow on an acre. In 1822, an acre of Swedish turnips produced 1096 bushels, and an acre of white globe turnips 1143 bushels."

To save labour some prefer sowing the seed broadcast, and hoeing once among them, thinning out the plants to proper distances. The quantity of seed sown, may be from one and a half to two and a half pounds per acre.

Raising seed.—It is evident that if one variety of turnips succeed better on a particular soil than another, a farmer ought to

be careful to continue his own seed. The usual mode is to select the most approved specimens of the variety to be raised, at the season when they are full grown, and either to remove all others from the field, and leave them to shoot into flower stems next year, or to transplant to a place by themselves where they will be secure from the farina of other plants of their genus. In either case they must be protected, by earthing up from the Winter's frost, and in the ripening season from the birds.

The true sort of Swedish turnip can very easily be kept by only attending to the plants when in flower. All the degenerated ones bear bright yellow flowers, which should be pulled out before the seed ripens. The true sort bear a *brownish* yellow flower. This saves the trouble of transplanting, if a ridge or corner of the field can be found convenient for saving.

The *diseases* and *injuries* to which turnips are liable, are various; but they neither admit of prevention nor cure by art. Under favourable circumstances of soil, climate, and culture, they seldom occur; and all that the cultivator can do is to prepare and manure his land properly.

Storing turnips.—The following method of preserving turnips is recommended from good authority—Goodsell's Farmer.

The turnips are put in pits for the Winter. The pits are limited to two feet in width, and of an indefinite length, and are dug in a dry situation, seldom more than two feet deep. When the pit or hole is filled with roots as high as the surface of the ground, the turnips are laid by hand, the tops out, and sloping to the centre, until they terminate in a ridge, which is generally about two feet above the ground. The whole are then covered with straw and then with earth. The important point follows: The crown of the ridge is then pierced with an iron bar, at intervals of a yard, and the earth pressed out so as to leave an entire aperture into the turnips, and into these apertures a wisp of twisted straw is loosely inserted. The roots will heat, and unless the rarified air is permitted to escape, the turnips are apt to rot. The openings permit its escape, without danger of the frost doing injury. With this precaution we have not lost one bushel in a thousand. The same course would no doubt be beneficial in preserving the *mangel wurtzel.*

CHAPTER XV.

TARES, RAPE, AND MANGEL WURTZEL.

Tares.—This plant stands at the head of those cultivated for green crops, perhaps both as to natural order and intrinsic value. It has become a principal object of the husbandry of very many well-regulated farms in this country, as it has long been in several districts of Great Britain.

Tares are a sort of pea, of which there are many varieties; but two only are cultivated in Europe, known as Winter and Spring tares. These are two varieties, if not two distinct species: one has a black seed, the other a white, and this distinction is permanent.

These plants are annual, and perish soon after they have perfected their seeds.

In the Quarterly Journal of Agriculture, is a paper on the cultivation of tares in the United States, by Dr. William Beach, of Westchester, New-York, to which we are indebted for most of the following account.

Advantages of Tares.—The advantages of Tares are thus given by Sir Arthur Young, who first introduced them into England. He says, "the cultivation of tares is extending every year, in consequence of their importance becoming better understood. The author of this essay feels both pleasure and pride in having been the first person who raised them on a large scale, and publicly recommended them to the notice of agriculturists. Now in 1821, after thirty years' experience of their utility, it would be difficult for him to say more in their favour than they deserve. But he takes leave to observe that they may be made one of the principal means of enabling the arable farmer to support as much live stock as the grazier.

"For during the time they occupy the ground they produce as much green food of the best quality per acre, as the richest grazing land; and the ground may be cleared of them in such good time (in June) as to admit of raising a clean crop of either turnips, cole, cabbages, or even potatoes, on the same soil, in the same year; or in lieu of any of these plants, if the soil be

infested with couch, that may be eradicated, and the land sown with wheat in October; or even after the crop of either turnips, cole, cabbages, or potatoes, have been cultivated and removed, the same soil may be prepared, and sown with either wheat, barley, oats, or pulse. By this arrangement three valuable crops may in any place be obtained every two years.

"Tares support horses, and will make both sheep and bullocks of every size and breed fat; they are excellent for promoting the secretion of milk in cows, ewes, and mares; they suit every situation, and flourish on almost every variety of soil. They do not depend on any particular market, and above all they manure the land fit for the immediate production of turnips, or cole; whereby a succession of green crops can be kept up, that would fatten a very increased quantity of live stock, and be the means of raising in situations the most distant from towns, an abundance of those great sources of fertility, dung and urine.

"A judicious rotation of tares, turnips, cole or hardy cabbages, potatoes, clover, or sanfoin, may with perfect ease be made the means of rendering all arable land as rich as can be desired, and poor sheep-walks, downs, and wastes, of ten times their former value.

"Tares yield a great deal of green food of a valuable kind, for the support of and fattening all sorts of live stock; horses, neat cattle, sheep, and even hogs, thrive well on them.

"It is perfectly clear," continues he, "that this crop more than repays every expense in obtaining it, by manure, and the improved condition of the soil. It is also nearly equally clear, that a good crop of it yields a surplus of *seven pounds* per acre. But suppose the surplus should by any unforeseen circumstance be reduced to *six pounds* or even to *five pounds*, it still is the production of the season of Winter and Spring, a time when in any other system, nothing can be obtained; and it completely avoids fallow for either a year, or half a year, by which a great additional expense would unavoidably be incurred. And it may be insisted on, that the soil is in a much better condition after tares than after any fallow.

Tares are suitable for almost every sort of soil, but for clay they are particularly so, owing to their coming to perfection in June, when they may be either eaten in cribs upon the soil, or carted from it without fear of poaching. And after the tares are off, there is time enough to cleanse the soil, and sow it with wheat in the best possible condition, certainly in better condition than after a whole year's fallow.

Mr. Checkett, of Belgrave Hall, near Leicester, in 1821, had cultivated tares and wheat alternately for ten years, on a few acres of strong clay soil, with abundant success.

"Tares," says the author of an old work, entitled the Art of Husbandry, "are good strong nourishing food for cattle, and are propagated after the manner of peas. Sown early, and ploughed in just at their time of blooming, they will make the ground light and mellow, and enrich it, especially stiff clays."

Tares are of as great advantage to land as other pulse, and rather to be preferred to feed cattle with than any other thing.—They need but one ploughing, and want no other manure than ploughing in of the last stubble, because they enrich the land themselves.

"The real money difference," says Sinclair, "which tares have over a Summer fallow, is from six to seven pounds per acre—(from thirty to thirty-five dollars)." "Perfection in the cultivation of arable land," says Young, "consists in obtaining both tares and turnips in succession the same year." *A succession of tares and turnips may be raised and consumed on dry land, till it is made of any desired degree of richness.*

Cultivation.—The land for Winter tares should be prepared during the month of September, or about the same time as for Winter grain, in about the same manner. If the quality of the soil is not already good, or it should be very poor, a coat of manure should be given, after which two bushels of the seed mixed with eight quarts of oats, should be sown to the acre, and harrowed or ploughed in the same as for field peas: they must not be buried too deep.

Harvesting.—As soon as the plants begin to blossom, they must be cut with a scythe and given to stock, or when designed for manure, they must be ploughed under, the same as clover.

There can no longer be any doubt, that the advantages of tares must be very great, not only for soiling or feeding different kinds of stock, but likewise for manure. Most farmers know the fertility imparted to the soil by ploughing in green crops, particularly clover; but there are some objections to all kinds grown for that purpose, not excepting even clover, which is considered the best. Clover being a biennial, little or no benefit can be derived from it till the second year, whereas tares are fit for this purpose in a few months, and probably yield as much or more vegetable matter per acre. They completely obviate the necessity of a Summer fallow for Winter grain, turnips, late potatoes, cabbages, &c. in addition to the richness of the soil which they impart. Another fact worth recording is, that no vegetable draws less food from the soil; and they yield a considerable quantity of seed, which are valuable for sowing, poultry, &c. The cultivation of tares is therefore recommended, with the conviction that they will prove a very valuable crop.

The produce in seed has been forty bushels per acre. Tares

are subject to few diseases except that of mildew, and this is of rare occurrence.

RAPE.—This is a plant of the cabbage family, and is extremely valuable, particularly for sheep, which it fattens almost magically. It comes in, too, very opportunely betwixt tares and turnips.—Sheep turned into rape will at first be shy of it, but soon become passionately fond of it; the few first days it scours them a good deal, but they soon get accustomed to it, and fatten at a most extraordinary rate.

A small portion of it should be set off with some kind of fence, and the sheep which are wanted to turn off quickest, let in first. Aged ewes may be got fat rapidly by means of rape, in time to turn off before Winter sets in; cattle will also eat it, and thrive.

Rape does very well sown broadcast, about a quart to the acre, upon new land that has been burnt over; and in drilling it, land should be prepared with manure, and kept clean.

It will do to sow the end of May, and early in June. The plants rise high, have abundance of broad succulent leaves, and are ready to be turned in upon in August and September, early enough for a crop of wheat.

Rape is a biennial, and seeds the second year. The plants which are intended for seed should not be much eaten down, or they will rot; those who want only a small quantity of seed, can select a few plants, bury them in litter when the Winter comes on, and set them out early in the Spring.

MANGEL WURTZEL.—This is a beet which grows to a very large size, and has greatly attracted the attention of agriculturists, from its excellent quality as food for cattle, and from its great productiveness. All the varieties of beets are valuable, on account of the saccharine matter they contain. The white, or sugar beet, is largely cultivated in France for the purpose of manufacturing into sugar.

The mangel wurtzel should be cultivated upon a rich deep soil, and in a manner similar to other root crops, the rows being three feet apart, and the plants distant at least a foot from each other in the rows. This will admit of the proper cultivation with the horse-hoe, by which the crop may be kept perfectly clean. The leaves are very abundant and broad, and may towards the Fall be taken off and fed to the cows. The plants themselves should be taken up before any frosts come on, and secured in heaps, as potatoes are usually done.

This root is a fine succulent food for cows towards Spring, which by its means may be kept in a flush of milk until warm weather.

Under favourable circumstances, an acre of mangel wurtzel will produce from thirty to fifty tons of roots. Where there are occasional vacancies in the rows, these should be supplied by transplanting; but the crop ought, if possible, to be raised without disturbing the seed after it is planted, except inasmuch as incidentally occurs in cultivation; for the experience of the cultivators of the sugar beet has established the opinion, that transplanted roots are less sweet than undisturbed ones.

Those who choose to cultivate this root, will find it their interest to be very particular in the selection of seed: the finest plants should be put by for this purpose, and the earliest seed collected. Indifferent seed on a poor soil, will always bring disappointment.

A writer in the Genesee Farmer, prefers mangel wurtzel to the common English turnip, to cultivate for cattle. He says,

"It is a trifle more expensive to raise it, requires to be sown about a month earlier than ruta baga, is not so easily preserved through the Winter, and requires rather a richer soil. On the other hand, it thrives best on soils too heavy for the turnip, the bulk of crop is greater, it can be sown to advantage after once ploughing, and is never eaten by insects as turnips are. This being a very certain crop, it received the name of root of scarcity, meaning, I suppose, that it never failed in times of general scarcity. Cattle, sheep, and hogs, prefer it to any other root I have ever seen, after they become used to it. Two pounds of seed will suffice for an acre, in rows three or four feet apart. I have always been sensible of a loss of time and labour, when I have planted this crop closer than four feet by fifteen inches from one plant to another. It is a gross feeder, and I believe no soil can be too rich for it; but it will amply repay the labour bestowed on it. I have raised them weighing twenty-five pounds each, and I believe there was one of these roots exhibited in London weighing 42 pounds.

"I will add, how I proceed with the work of sowing the seed, which for each kind does not vary much—having no drilling machine. I get a piece of slab or plank six feet long, more or less, according to the distance I intend to have the rows—saw out three blunt teeth, one at each end and one in the middle—put a long handle in the centre, and draw this thing over the ground crossways of the last ploughing, letting one outside tooth go in the last marked row, thus making two rows every time. To expedite the sowing, I moisten the seed a little, and add a little lime or some white substance. This makes it easy to see how thick I sow it, and enables me, by going at a quick step, to put in several acres in a day if required."

CHAPTER XVI.

FLAX AND HEMP.

Culture of Flax.—Flax, says the author of the Treatise on Agriculture (Armstrong), is of Asiatic origin, and from its hardiness and usefulness is generally diffused over the globe. No plant undergoes a greater change in the hands of labour, and few better repays the labour bestowed upon it. It is cultivated with two different views—one, for the fibre which surrounds the stem, and which is converted into cloth,—the other, for the seeds, which yield an oil very important to the arts. These different objects have been supposed to be best promoted by different kinds of seed, and different kinds of culture. This difference, however, is supposed to depend more upon the culture, than in the variety of the seed; for it has been invariably observed, that if flax seed (wherever grown) be sown *thinly*, the stem is shorter, the fibre coarser, and the seed more abundant; and that when it is thickly sown, the fibre is of greater length and much finer.—This difference can be still further increased in the culture. The row husbandry, admitting of more ventilation, will hasten the maturity of the plant, and increase the quantity and quality of the seed; whereas the broadcast method will, on the other hand, retard the maturity of the plant, lengthen the stem and the fibre that covers it, and in the same proportion diminish the quantity of seed.

Flax may be made to follow potatoes very advantageously; and we have seen the practice of sowing it with a crop of that kind, earnestly recommended.

The time for *harvesting* flax depends on the considerations suggested above. If *seed* be the principal object of the crop, the harvesting ought not to begin till that is completely ripe; whereas if the fibre be the main object, the flax should be pulled two or three weeks earlier. Flax thus prematurely killed is called *white* flax, and makes the finest thread.—The exhausting quality of this plant has been long known, and is generally admitted. Pliny says of it, that it burns and degrades the soil, in return for the nourishment it receives from it.

Soil.—The soils which rank first in this country as most suitable for flax, are the flat bottoms that are covered with Fall and Spring floods, which subside early enough in the season to get in a crop. The next in estimation are the strong black loams or clay, or hard pan, that will retain moisture. Yellow loams with a holding subsoil, may be rendered suitable for flax by a proper cultivation; and since the discovery that plaster of Paris is an excellent manure for it, a crop may be obtained on lighter land with much more certainty than formerly. Perhaps the characteristic of best garden mould may be applied to a flax soil, viz. retaining sufficient moisture, and all that falls, without ever being saturated; but on any soils the surface should be completely pulverised, and never be worked when wet.

Manure.—No dung should be applied to the land when the flax is sown, but may be put on plentifully with the previous crop. Lime, marle, shells, leached ashes, &c. are not liable to the same objection as dung, viz. producing too rapid a growth.

Top dressings, soon after the plants appear, of plaster, ashes, soot, &c. are highly beneficial, as they not only encourage the growth but are a protection against worms, which sometimes attack young plants, and may be considered the only enemy they have except weeds. Salt has been mentioned as an excellent manure to plough in with flax, at the rate of five bushels to the acre. Probably more would be better.

The best preparatory crops are potatoes, corn, and roots.

Seed.—That of the last year's growth should be obtained, if possible. The usual marks of good seed are, that it be plump, oily, and heavy, of a bright brown colour, sinking readily in water, and when thrown into the fire to crackle and blaze quick.—With regard to the quantities to be sown, no particular directions can be given, as it depends on the various qualities of soil, goodness of seed, &c. It requires to be sown thickest on rich soil. From two to four bushels is about the quantity usually sown.—Thick sowing is to obtain good flax—thin, to obtain seed.

Sowing.—It is recommended to sow as early as possible, and in the broadcast method to distribute the seeds equally.

Weeding is considered necessary to secure a good crop of flax, which is a very tender plant when young, and more easily checked in its progress by weeds than any other. This should be carefully done when the plants are three or four inches high.

Pulling.—This should be performed as soon as the leaves begin to fall, and the stalks show a bright yellow colour, and when the bolls are turned a little brown.

When the flax is lodged, it should be pulled immediately in any stage of its growth, or it will be entirely lost. Great care is requisite in sorting the different lengths, and keeping them sepa-

rate till after the flax is heckled, or much waste will ensue in that process.

Saving seed.—As soon as the flax is dry enough to be put under cover, it should be rippled, as it is termed. A comb resembling the head of a rake, but with teeth longer and nearer together, made of hickory or oak, is fastened upon a block, and the flax taken in parcels no larger than the hands can firmly grasp, is drawn through, and the bolls rippled off. Attention to sorting at the same time, should be continued.

The bolls are to be riddled and winnowed immediately, spread thin on a clean floor or on sheets in the sun, and when sufficiently dry, and beginning to open, threshed.

Product.—It is by no means uncommon in Europe, to obtain 800 pounds of flax from an acre; but then little seed is obtained. The average crop in New-England is about 200 pounds, and six or eight bushels of seed. Four hundred pounds of good clear flax, and eight or ten bushels of seed, may be produced under favourable circumstances.

The preparation of flax by steeping is very general in the great flax growing countries of Europe, but it is not quite finished in the water. It remains spread some days on the grass, which is necessary to render it soft, and give that silvery appearance so desirable. The destructive process of dew rotting is most commonly resorted to in this country; and when water is used, it is at an improper season, and the process imperfect, which is the cause of its being so harsh and brittle.

The flax should not be put into the water until about the first of October, and remain from ten to fourteen days, according to the temperature of the weather, and should be taken out before the fibres separate freely, spread on the grass, when the frost will very much assist the operation, and the flax exhibit a gloss and softness which it is impossible to give it otherwise. The dressing is done by hand, or by machinery impelled by water, &c.—(*From Essays on Flax Husbandry, by S. W. Pomeroy, Esq.*)

Culture of Hemp.—The hemp is a plant of equal antiquity with the flax. It is supposed to be a native of India, or some other Asiatic country, being too tender to be ever naturalized in Europe.

It grows to a great height on good soils, sometimes to six or seven feet in this country, but in Italy generally higher; and Crud states that he has seen it fifteen feet eight inches high in the Bolognese territory, and a friend of his, eighteen feet six inches: in both cases the fibre being of remarkable beauty. This luxuriance of the hemp in warm countries may be one reason why it has never been much cultivated in this country.

The culture, management, and uses of hemp, are nearly the same as of flax. When grown for seed it is a very exhausting crop; but when pulled green, it is considered a cleaner of the ground, and is said to have the property of preserving from insects any crop which it may surround. The objections to this crop are, that its coming in the midst of harvest is embarrassing; and that the attention it demands in every state of its progress is too great, where it is only a secondary consideration.

The *soils* most suitable for hemp are those of the deep black putrid vegetable kind, which have a situation low, and somewhat inclined to moisture, as well as the deep mellow loamy sandy sorts. But the quantity of produce is in general much greater on the former than on the latter; though, according to some, of an inferior quality. Mellow rich clayey loams do well; and nothing better than old meadow land.

The *preparation of the soil*, and place in the rotation, are the same as for flax.

The *season of sowing* is towards the beginning of May, when there is no longer any danger of frost injuring the rising plants. The quantity of seed is from two to three bushels, according to the quality of the land. In quality the seed must be fresh, heavy, and bright in colour. Broadcast is the universal mode of sowing, and the only after culture consists in keeping off birds when it is coming up; in weeding; and sometimes in supporting the crop by cross rods or lines, as in the case of flax.

In taking the hemp crop, two methods are in use according to the object in view. When the crop is grown entirely for the fibre, it is pulled when in flower, and no distinction made between the male and female plants. But as it is most commonly grown, both with a view to fibre and seed, the usual practice is to pull the male plants as soon as the setting of the seed in the females shews that they have effected their purpose. As the female plants require four or five weeks to ripen their seed, the males are thus pulled so long before them.

In the operation of pulling the males, the pullers walk in the furrows, between the ridges, and reach across to the crown of the ridge, pulling one or two stalks at a time, and carefully avoiding to tread down the female plants. The male stalks are easily known by their yellowish hue, and faded flowers. They are tied in small bundles, and immediately carried to the watering pool, in the manner of flax.

The operation of pulling the females commences when the seed is ripe, which is known by the brownish or greyish hue of the capsules and fading of the leaves. The stalks are then pulled and bound up in bundles, being set up in the same manner as grain, until the seed becomes so dry and firm as to shed free-

ly; great care should be taken at pulling not to shake the stalks rashly, otherwise much of the seed may be lost. It is advised, that after pulling the seed, hemp may be set to stand in shocks of five sheaves to dry the seed; but in order to prevent any delay in watering, the seed-pods may be cut off with a chopping knife, and dried on canvass exposed to the air, under some shed or cover. This last method of drying the seed will prove of great advantage to the hemp, as the seed and pods when green, are of such a gummy nature, that the stems might suffer much by sun-burning or rain; which will discolour and injure the hemp before the seed can be sufficiently dried upon the stalks. Besides, the threshing out the seed would damage the hemp in a considerable degree.

Hemp is *watered* (provin. water-rotted), *bleached* (provin. dew-rotted), and *grassed* in the same manner as flax. Grassing is omitted in some places, and drying substituted; and in other districts watering is omitted with the female crop, which is dried and stacked, and dewed or bleached the following Spring. On the continent hot water and green soap has been tried, and here as in the case of flax, it is found that steeping two hours in this mixture, is as effectual in separating the fibre from the woody matter, as watering and grassing for weeks.

Although hemp *in the process of manufacturing*, passes through the hands of the breaker, heckler, spinner, whitester, weaver, and bleacher, yet many of these operations are frequently carried on by the same person. Some weavers bleach their own yarn and cloth, others their cloth only; some heckle their tow, and put it out to spinning, others buy the tow, and put it out; and some carry on the whole of the trade themselves.

The *produce of hemp in fibre*, varies from 3 to 6 cwt. per acre; in seed from 11 to 12 bushels.

The *uses of hemp* are well known, as well as its great importance to the navy for sails and cordage.

An oil is extracted from the seeds of hemp, which is used in cookery in Russia, and in this country by painters. The seeds themselves are reckoned a good food for poultry, and are supposed to occasion hens to lay a greater quantity of eggs. Small birds in general are very fond of them, but they should be given to caged birds with caution, and mixed with other seeds. A very singular effect is recorded, on very good authority, to have been sometimes produced by feeding bulfinches and goldfinches on hemp seed alone, or in too great quantity; viz. that of changing the red and yellow on those birds to a total blackness.

The *hemp* has few or no diseases.

CHAPTER XVII.

CULTURE OF THE HOP.

The hop is a perennial rooted plant, with an annual twining stem, which on poles or in hedges, will reach the height of from twelve to twenty feet or more. It is a native of Britain, and most parts of Europe. The female blossom is the part used, and as the male and female flowers are on different plants, the female only is cultivated.

The soils most favourable to the growth of hops, are clays and strong deep loams; but it is also of great importance, that the subsoil should be dry and friable; a cold, wet, tenacious clayey understratum, being found extremely injurious to the roots of the plants, as, when they penetrate below the good soil, they soon become unproductive, and ultimately decay.

In preparing the soil, previous to planting, considerable attention is necessary, by fallowing or otherwise, to destroy the weeds and to reduce the soil to as pulverised a state as possible. The ridges should also be made level, and dung applied with a liberal hand. The most effectual preparation is trenching, either by the plough, or by manual labour.

The mode of planting is generally in rows, making the hills six feet distant from each other; though there are some people who, from avaricious motives, prefer a five feet plant. But as this vegetable when advanced in growth, produces a large redundancy of bind or vine, and leaves, it should seem that six feet cannot be too wide a distance; and that those which are planted closer, will, from too confined a situation, be prevented from enjoying a free circulation of the air; from which much injury may proceed, as blasts, mildews, moulds, and other accidents, not to mention the disposition of the vine to house, or to grow together at the top of the poles, whereby the hops are so overshadowed as to be debarred the influence of the sun, and prevented from arriving at half their growth.

The ordinary season for planting, is Spring, in February or March; but if bedded plants, or such as have been nursed for one Summer in a garden, are used, then by planting in Autumn,

some produce may be had in the succeeding year. But acccording to the author of "*the New Farmer's Calendar*," the time for planting is commonly that of dressing and pruning the old vines, when cuttings may be had, which is in March or April; but when root sets are used, as on the occasion of grubbing up an old plantation, October to the beginning of November. But at whatever period they are planted, great care should be taken that the same sorts be planted together, as by this means there are advantages derived in their after culture.

The plants or cuttings are procured from the old stools, and each should have two joints or eyes; from the one which is placed in the ground springs the root, and from the other the stock or bind. They should be made from the most healthy and strong binds, each being cut to the length of five or six inches. Those to be nursed are planted in rows a foot apart, and six inches asunder, in a garden; and the others at once where they are to remain.

An interval crop of beans, is sometimes taken in the first Summer of a hop plantation; but the propriety of it is doubtful.

The after culture of hops, besides the usual processes of hoeing, weeding, stirring, and manuring, includes earthing up, staking, and Winter dressing.

Hoeing may be performed with a horse implement; *stirring*, though usually done with a three pronged fork, may be done with a plough; *manuring*, is either with well rotted stable dung, or compost, either in *Spring* or *Fall*. Some spread the manure between the rows, others lay it on the hills. It would seem, however, that the best time was the Spring, and then it should be turned under by the plough. *Earthing up* is performed the first May after planting, whether that operation be performed in Spring or Autumn.

In dressing the hop plants, the operations of the first year are confined to twisting and removing the haulm, to which some add earthing up in Autumn. The yearly operation of staking or setting the poles, commences towards the end of April, or at whatever period, earlier or later, the shoots may have risen two or three inches. Two or three stakes are usually put to a hill. *Tying the shoots or vines to the poles* is the last operation in the after or Summer culture.

Taking the crop is a most important operation in the hop economy.

The following observations on that subject, together with their subsequent management, are taken from a letter of Mr. Fidler, of Albany, addressed to Judge Buel, and published in the Cultivator.

Picking.—The time for picking hops varies—light soils and dry situations are earliest; even in a yard of a few acres, situated

on a side hill, the highest ground is often ready for picking some days before the lower; and sometimes from the poverty of the land, the middle, or it may be the lower part, is ripe first. In commencing picking, too much care cannot be taken in gathering those first that are *ripe*, and not picking those that are *largest*, as is often the case. The time of picking may be known by their change of colour, from a deep green to a light yellow tinge. If they have seeds, the hop ought to be gathered as soon as the seed turns brown; but the certain indication of picking time, to those who are familiar with this article, is when the *lupulin*, or small globules of the bright yellow resin, are completely formed in the head of the hop, at the bottom of the leaves, and the leaves are readily rubbed from the stem. The lupulin (or flower of the hop as it is commonly called) is the only valuable part, and if gathered too early, before it becomes perfect turpentine, it soon dissipates and loses its fine aromatic flavour and all its medicinal qualities. Hence, gathering hops too soon is a total loss, and instead of imparting a palatable, pleasant flavour, and giving its fine tonic balsam to ale, they are unquestionably an injury, and ought not to be used; and if gathered too late, the lupulin drops out, and the hop is of no value; bnt the experienced cultivator takes the medium, commences when the hop is first ripe; has every thing prepared—his hands, kilns, baskets, baggings, &c. Five or six days ought to finish the whole process of picking and curing, if his yards ripen about the same time. The hop should be picked clean, without leaves or stems, and if possible without dew on them, nor *pressed too close*, nor put in *too large quantities*, before going on the kiln, or they will *heat*.

Drying.—No rule can be given for the thickness they ought to be spread on the kiln, or even for the length of time necessary to dry them. A skilful operator is the only safety in this process. Care ought to be taken that the kiln draws well, as much depends upon its draft—the steam should not be allowed to fall back on the hops, and must pass off freely.

Preparatory to putting the hops on the kiln, it must have a fire put in, made perfectly dry, and fumigated by burning brimstone to take away all the bad smell, and when perfectly sweet, a layer of hops put on, say eight or ten inches deep, and this may be increased or lessened as the operator finds the draft. The time used in drying will also depend on the quantity of hops on the kiln, and on the draft, say from eight to sixteen hours; but they must not be removed from the kiln until the core or stem of the hop is crisp and well dried, they must then be put upon a floor, and occasionally turned, until the leaf becomes tough, when they are ready for bagging.

The fuel used for drying, must be of the sweetest kind, and

perfectly charred, and the best is beach, birch, hickory or maple. Pine may not be used under any circumstances, nor any brimstone, only as before directed. When the fire is once put into a kiln of hops, it must never be permitted to slacken or go out, until they are dried. The fire should never be so hot as to burn or leave the least taint of fire on them.

Remarks.—I would suggest to all our hop raisers a system to be *adopted and never deviated from*—that is to divide very carefully the hops into three equal parts or parcels, the first, second, and last pickings. If six days are consumed in picking, let the hops of the two first days, the third and fourth days, and the two last days, be kept separate, bagged and marked; each parcel will by this method be more valuable to the brewers, and enhance the price of those that should thus be brought to market if skilfully picked and cured. It would also be a good regulation, to have all our hop raisers put as near as may be, 220 pounds in each bag, and have all the bags of about one size, say five feet long, two feet wide, and eighteen inches thick—this would be more convenient for the brewer, but particularly so for shipping; and should we be so fortunate as to rescue our hops from their present degraded condition, they will soon be one of our principal articles of commerce.

The next serious injury from want of skill in curing, is that of scorching or burning the hops on the kiln. There are large quantities every year of western hops, destroyed or partially injured in this way. Our eastern hop raisers are far before those of our state in curing them on the kiln. Scarcely an instance of scorching on the kiln, or of heating after being bagged, is known among them, and the fault with us must be want of care or skill.

The hops of this state as a whole, are not cleanly picked, and are often injured by having them heated before going to the kiln. Many have their kilns so low, that the steam does not go off, consequently the hop is stewed in its steam, and by this means materially injured. A common practice of using coal, partially charred, smokes the hops, and their rich flavour is materially injured, and often totally destroyed. That we may not forget, let us recapitulate our grievances: About one-half our hops are injured by picking before ripe, (our eastern hop raisers do more injury in this respect than our western farmers); another part are injured by partial drying, and bagging them in that state; another part are scorched or burned; some are heated before going on the kiln; some stewed on the kiln; some smoked; some gathered with the leaves and vines; some send us brimstoned hops; and a few good fellows bring us as fine hops as any part of the world can boast of, and they ought all of them, or nearly so, to be of this fine quality.

CHAPTER XVIII.

CARROTS—ARTICHOKES—CHICCORY.

Carrots.—*The field culture of carrots* for the purpose of providing a succulent food for Winter stock, begins to be very deservedly more and more an object of attention.

Among vegetables, the carrot is deemed by many writers, both in Europe and America, to combine more advantages than almost any other, considering the quantity and quality of its produce, and the effect of its cultivation, in deepening, clearing, and ameliorating the ground, for subsequent crops. They will yield, with the best cultivation, from six to eight hundred bushels to an acre. They require a mellow soil, into which they can penetrate deeply. They will grow very well on one which is moderately rich; provided it be well and deeply mellowed, to the depth of ten or twelve inches. If the plough do not go deep enough at once, it should be trench ploughed; that is, the plough should pass twice in the furrow. A fertile sand, a sandy loam, a dry warm loam, or a fertile gravelly loam, are each suitable for them, with proper manuring and cultivation.

Seed.—The seed should be obtained from fine deep red, or orange coloured roots, carefully preserved, and collected only from the centre seed stalks. The pale coloured roots, and yellow ones, are fast degenerating. About four and a half pounds of seed are sufficient for an acre, when sown broadcast.

Culture.—Carrots should be planted as soon as the ground can be made light and loose,—the last of April or first of May is late enough. They will do tolerably well later, especially if the seed are steeped. Before sowing or planting, rub the seed betwixt the hands, to take off the beards, to prevent them from sticking together; with the same intention it is sometimes mixed with sand, or fine sawdust. Put on a sufficient quantity of the most rotten compost, to make the ground rich. Fresh dung should not be applied to this crop.

The sowing is performed either in the broadcast way or the drill. In the former, the seed is covered with a rake instead of a harrow, to prevent its being covered too deep. The first hoeing being finished, after they have arrived to a suitable size, the

ground can all be harrowed over, without any injury to one plant, perhaps, in fifty, if they are uncovered of the dirt thrown on by the harrow. This is a proper time to thin them, letting them stand about six inches asunder. A second hoeing should be given as soon as the weeds and the growth of the crop render it necessary. If the plants grow luxuriantly, they can be thinned again and fed to the hogs. The crops are much larger, when the roots have sufficient room. (In England, the usual distance is fifteen to eighteen inches each way.) Further hoeings will occasionally be requisite to keep the ground deeply stirred and perfectly clean. The hoeings are best performed with a sharp narrow hoe.

If the ground is not too dry, carrots should be sown on ridges, two feet apart: they may be made with a horse plough; and the top of each ridge should be levelled with a rake. Immediately after the ground is ridged and raked, open a drill with a hoe, plant the seed pretty thick, cover about an inch deep, and press down a little with a hoe or shovel. About two pounds of seed will be found sufficient. Success in cultivating this vegeble, depends entirely on early attention in weeding, thinning, hoeing, and ploughing—the plants should not be left for a crop nearer than three or four inches. It is not the number but the *size* of carrots that make a large crop. If the plants are suffered to stand thick, they will necessarily be small, and of an inferior quality. They should at all times be kept free from weeds, and the earth loosened with a hoe. If they are planted on a side hill, be careful not to have the rows go *up and down*, as they are apt to wash. If heavy rains fall, the ground between the rows should be stirred as deep and as near to them, as can be done with safety to the roots.

Instead of one row on a ridge, some sow two rows, ten or twelve inches apart; and thin the plants to four or five inches distance in the rows, with intervals of three feet between the double rows, for tilling them with the plough.

Taking up.—Carrots grow considerably in October—the first of November is early enough to gather them. Run a plough close to the plants, so as to turn the earth from them, and they may then be easily pulled up. Where it is not convenient to do this, the spade and dung-fork will be found most convenient.—Cut off the tops near, but not quite to the crown of the plant. All that are broken or cut, being liable to decay, must not be put with the heap. Carrots are easily kept in masses, in a cellar or place out of reach of frost, provided they be *dry* when put into it; but if *wet*, they will be in great danger of heating and decaying. To prevent this, they ought to be taken out of the ground in dry weather. If possible, after they are topped, they should

be permitted to be in heaps, under cover, for about eight or ten days.

Product.—Carrots will amply repay every expense of the finest culture; and from their extensive utility, it were much to be wished, they were more generally introduced. In the stable, they are a good substitute for grain to horses, not employed in any quick work, and partially to those that are: they are peculiarly well calculated for fattening oxen and sheep, as well as feeding cows, horses, and hogs. One bushel per day is the usual allowance for working horses. The tops are valuable for cows, sheep, and swine.

Mr. Butler says, that 500 bushels to the acre is a good crop, but that he has known 2,500 bushels to be raised upon an acre, or in that ratio; and that it is worth 2*s.* when given raw to hogs, cattle, and sheep, or 2*s.* 6*d.* when boiled, or steamed, and mixed with bran; such feed makes excellent pork, beef, mutton, butter, and cheese.

Jerusalem Artichokes.—This root, though not generally in much esteem, is still considered by some as valuable for feeding hogs, and other animals.

One cultivator says, that from an acre of ground he obtained between 70 and 80 tons of this root. He is of opinion that seven acres will yield three hundred and ninety-six tons, which will keep 100 swine for six months.

Another found the produce of this root to be 480 bushels to the acre, *without dung*. Its chief recommendations are, the certainty of a crop; its flourishing upon almost any soil; not requiring manure, and being proof against the severest frosts.

The following is submitted as probably the last experiment of which we have any account.

"I was determined," says the writer, "to prove whether or not artichokes could be cultivated to greater advantage than the potato, as food for cattle. I took two sacks, and planted them in the midst of a five acre piece of potatoes. I set them whole without cutting, measuring correctly the eighth part of an acre; the produce was in proportion to six hundred and forty bushels per acre—the potatoes three hundred and twenty-seven bushels. The following year, the memorable one of 1826, I planted half an acre on a piece of thin gravel, old tillage land, in its regular course of preparation for a vegetable crop after wheat; they maintained their verdure through that extraordinary dry Summer, and produced one hundred and fifty bushels; but the potatoes by the side of them were completely set fast; they never formed a bulb. The year following I set an acre on part of the same soil, but of better quality; it produced five hundred and seventy

bushels *without any dung*. An half acre on the same land, with the usual quantity of dung for turnips, produced two hundred and ninety bushels (a bad compensation for eight loads of excellent dung). This present season an acre on the same land (part of my turnip fallows) produced five hundred and seventy-six bushels; but the wet state of the soil when taken up, and being a vegetable of uneven surface, which causes the soil to adhere to it more than to a potato, renders it difficult to come at the exact quantity. From an experiment I made of washing a sack, I can safely assert, I have five hundred and thirty bushels of clean roots; whilst the vegetables on our flat gravels do not equal this by full fifty per cent in value, except the potato, which produced three hundred and eight bushels on the same soil. I could never raise more in favourable seasons.

"The cultivation of the artichoke is the same as of the potato, except that it requires to be set early—not later than March; if laid above ground all Winter, it is proof against the severest frost. When once cleaned no weed can live in its dense shade; horses, beasts, and sheep, consume it with avidity; pigs prefer a potato to it in its raw state, but prefer the artichoke when boiled or steamed. It attracts the game in a most extraordinary way; they resort to its shade in Autumn; it forms one of the finest covers in nature. We are so fortunate as to have but little game in our township; I do not recollect ever having seen even a Swedish turnip bitten by a hare or rabbit, notwithstanding they will consume the artichokes left by the men in securing them.

"If potatoes can be profitably cultivated as food for cattle, compared with Swedish turnips, mangel wurtzel, the sugar beet, &c. (which I much doubt,) the artichoke is vastly superior to them. The expense of culture is no more; it is not liable to be injured by frost; can be taken up at pleasure; it produces at least thirty per cent more, and on poor land full fifty per cent; *is far more nutritious*, and leaves the land perfectly clean. The only objection that can be urged against their cultivation for cattle in competition with potatoes, is that they require more care in taking them up. The frost not acting upon them so as to destroy vegetation, what are missed will, of course, grow amongst the succeeding crop, giving very little inconvenience in this respect."

CHICCORY.—A very hardy plant resisting extreme heat and cold; very early in the Spring, and soon covers the ground. It does very well on weak sandy soils, and from its great productiveness, is a convenient green food to soil cattle with. When intended for this purpose, it should be cultivated alone, in rows a foot apart; when intended for pasturage, it may be sown broadcast with Spring grain. Sheep thrive extremely well upon it.

It was first cultivated in England by Arthur Young, who holds it in high estimation. It is of such consequence, he says, for different purposes of the farm, that on various sorts of soil the farmer cannot, without its use, make the greatest profit.

Where it is intended to lay a field in grass for three, four, or six years, in order to rest the land, or to increase the quantity of sheep food, there cannot, he thinks, be any hesitation in using it. Lucern, he says, demands a rich soil, and will always be kept as long as it is productive, but upon inferior land it is not an equal object.

On all land where clover, from having been too often repeated is apt to fail, chiccory may be substituted to great advantage.

It does very well for soiling cattle, both lean and fattening. It is of excellent use for those who keep a large stock of swine; and it does exceedingly well in an alternate system of grass and tillage, as it will last four, five, six, and even more years.

To prevent its becoming a weed in succeeding crops, when the land is ploughed, only use a broad sharp share, and harrow in tares for feeding or soiling, or break it up for turnips.

CHAPTER XIX.

GREEN CROPS—SOILING—CHANGE AND IMPROVEMENT OF SEED.

Green Crops, sown for the purpose, or growing naturally, may be dug or ploughed in as manure, to great advantage.

By repeating this culture, says the Farmer's Guide, poor or worn out land may be made rich.

It is strongly recommended for all places where it is difficult to procure manure; where gypsum will not assist the soil, or where it cannot be had without too much expense. Buckwheat, rye, millet, pease, oats, clover, and turnips, are all considered suitable for this purpose. Perhaps buckwheat is the least suitable of any of them. Two crops of some of them can be ploughed in before sowing Winter grain. They must always be ploughed in when in flower, or at the time the flower is beginning to appear. To prevent the plough from choaking, if the ground is free from rocks, a roller should be passed over the crop, in the direction the plough is to pass—where this instrument is wanting, the back of the harrow can be used, giving it additional weight if necessary. In about three weeks the ground will be ready for another crop, which can be sowed upon the furrow.

Mr. Pomeroy, of Massachusetts, considers rye superior to any thing within our reach for this purpose. "In order to insure a sufficient growth in season to plough in for Indian corn and most of our root crops, rye should be sown the beginning or by the middle of August, and much thicker than when intended for a crop of grain. If it gets too forward before Winter, it should be fed down with light stock or mown. Winter rye, sown early in the Spring, grows rapidly, and will generally arrive at sufficient stature in season to be turned in as manure for ruta baga. Rye ploughed in when in full flower, and millet sown, which it will bring forward with great luxuriance, and that in its most succulent state turned in for wheat, may be one of the best fallow preparations for it that can be devised; and is probably the cheapest and most convenient process to restore an exhausted

soil. At the same time it should be considered, that gypsum acts more powerfully on soils thus prepared.

"Weeds have also been found very valuable for this purpose. Among the most active parts employed as manure, I have found, says a writer, the wild species of the genus Sinapis, ploughed in fresh in the bottom of turnip drills, at the rate of twenty tons per acre. The produce brought by auction $54, while the rest of the field manured with twenty tons of farm-yard dung, brought only from $40 to $45 per acre. Other weeds, such as nettles, thistles, ragwort, &c. produce crops superior to farm-yard dung. Potato stems, fresh ploughed in on clover lea for wheat, I have found to produce crops exceeding by two bolls per acre in quantity, with more proportionate weight of straw, the other parts of the same field manured with farm-yard dung, but otherwise under the same circumstances. The stems from three acres of good potatoes, will manure an acre for wheat to much better purpose than fifteen tons of farm-yard dung, the usual quantity allowed in that part of the rotation; clover after wheat being the crop which generally precedes fallow. Under the head of 'green manure,' I may here mention an experiment I this year made with pea-straw converted into dung without the aid of cattle. Having something of that sort on hand about the middle of last May, and being in want of some manure to finish a potato field, I had the peas thrashed at the mill, and the straw and chaff carried to the side of the potato field, and made up like a large hot bed, giving each layer of straw an ample watering. Fermentation soon commenced; and by the fifth day the mass was so far decomposed as to be easily filled into the carts. The effluvium in filling was almost intolerable. It was in this state laid in the bottom of the drills; the sets of potatoes were planted above, and the earth ploughed over the whole. Notwithstanding the dry nature of the ground, and the dry state of the weather in the Summer months, the part of the field manured with decomposed pea-straw yielded a better return than where farm-yard dung was applied."

J. D. Parks, of Dartford, says the value of green vegetables as manure was strikingly proved by him in the Spring of 1833. He had a trench opened of sufficient length to receive six sets of potatoes; under three of these sets he placed green cabbage leaves, but the other three had nothing but the soil. When the crop was dug up, the plants over the cabbage leaves yielded double the produce of the others.

So another authority says, "you may go on farming in this way—every time you turn up a coat of clover, turn down one—and your wheat crop will never fail, until your land becomes so rich, that you will have to reduce it with corn."

[illegible]—Soiling is a name applied to the practice of cutting [illegible] for soiling or fattening live stock. On all [illegible] a part of the clover is cut [illegible] after for the milch cows; and in [illegible] cattle.

[illegible] the advantage of this practice, in [illegible] for young and for fattening cattle. [illegible] are not known to have [illegible].

[illegible] who advocate this prac[illegible]

[illegible] is said by those who have [illegible] ground which, when pastured, [illegible] will abundantly main[illegible]

[illegible] general effect of soiling cattle [illegible]

[illegible]—There are six ways by which [illegible] their food; viz. By eating, [illegible] and breathing on it. Of [illegible] cutting the same, and feeding [illegible] quantity, every par[illegible] many products of the [illegible] in the pasture.

[illegible] *of the cattle.*— [illegible] and diseases; they are pro[illegible] suffer from the heat of [illegible] many keeping cattle in stalls, [illegible] always feeding [illegible] of the time. On [illegible] system, to let them [illegible] two hours in the forenoon, [illegible]

[illegible]—Although the quantity of [illegible] part of the season, when [illegible] yet it has been found from [illegible] a regular succession of succulent [illegible] diminished; and therefore [illegible] pasturing.

[illegible]—Soiling is supposed to afford [illegible] of manure from the same number [illegible] Summer manure is produced in the stable, [illegible] when in the most suitable condition; [illegible] scattered about fields, and exhausted by the air [illegible] is much wasted.

[illegible] other advantages attending this method of husban-

dry. The trouble of driving the milch cows to and from the pastures, is saved; the working horses and oxen are always at hand; and, what is of no small importance, when the cattle are housed the growing crops are in more safety.

The only offset to all these advantages is the labour of raising and cutting the food, and feeding and taking care of the stock.

The crops necessary for soiling may be rye (sown the preceding year), oats, barley, millet, (this has been cultivated to advantage in this State the present year,) Indian corn sown broadcast, clover, and various grasses; besides cabbages and roots, so arranged as to have a succession of succulent food through the season. Any sorts of grain sown to produce fodder for soiling, after being harrowed in, should be rolled, to make the ground smooth for mowing. If the soil be rich and the surface smooth, the grass may be cut when only three or four inches high, and will then yield a good swarth. Such ground well set with the grasses usually cultivated and inclined to moisture, may in this manner be mown three or four times in a season. The cutting of the rye, oats, barley and millet, should commence as soon as they will yield a good swarth, and be finished before they have passed the flowering state. If mown before they flower, they will shoot again; and if the growth be rich, yield second crops.

Indian corn will be well grown for soiling by the 10th or 15th of July: and will continue green and in full sap until the last of August. And in order to continue a supply of the rich, green food—to which probably no other vegetable of our country is equal, especially for milch cows—pieces of land may be planted or sown in succession, so that some may be in full sap to the last of September.

Rich mowing land will furnish a second and third crop of green fodder, that will answer to the middle or last of October. Perhaps late sown oats, hardier plants than Indian corn, may supply the place of grass. Pumpkins, also, during this month and the next, will furnish a most valuable food. To these may be added the tops of winter vegetables, such as carrots, turnips, &c. which will be useful till the middle of November.

Rye, oats, barley, and millet, when destined for soiling, should be sown twice as thick as when intended to ripen their seeds. In like manner, Indian corn may be planted in continued rows only so far apart as to admit a small plough in its culture, and with the plants only four or five inches apart in the rows. The surface of the ground should be smooth in the rows, so as to admit of mowing the corn; or it may be sown broadcast, ploughed or harrowed in by harrowing both ways, and afterwards rolled.

The essential point in soiling, is to make and save the greatest possible quantity of barn dung. Some of the most intelligent

farmers, therefore, have barns with cellars under them, for the purpose of receiving the dung of the cattle, and into these the dung and litter are constantly thrown. Suitable earths are also laid behind the cattle to absorb the stale as it runs backward, and these, when saturated, are also thrown down and mixed with the dung. The cellar should not be very deep, and should be open for the admission of air during the Summer. The bottom ought to be made water tight with clay. Others prefer sheds adjoining the barn, to keep the dung under cover to protect it from the rains. The proportion of valuable manure that the careful husbandman may provide by this system of management, is scarcely to be conceived.

The whole supply of food for the day, can be cut and carried to the barn in the morning. A light hand-cart, or wheelbarrow, will be found convenient for bringing in the grass from the parts of the field nearest the barn; and a horse-cart, from those most distant. Double sheds, in which a sufficient space is left before the cattle for the feeder to go with a large wheelbarrow to distribute their food, are perhaps the best constructions for feeding houses, being not only most commodious, but less building will be required for the same number of cattle than by having them all to face one way. The food is distributed, under cover, about six times a day, in due proportions, which the usual practical knowledge of a farmer will easily regulate.

Change and Improvement of Seed.—Most plants are found to degenerate to a certain degree, unless their seeds are frequently changed. This has been attributed to their cultivation in climates where they are not indigenous. But this can hardly be the sole reason; for it is found that most plants will be improved by having the seeds brought from the east to the west, and *vice versa*.

Providence, in making so large a world as this, seems to have designed that there should, nevertheless, be a common acquaintance among the nations which inhabit it. They are invited abroad, for conveniences which their own climates do not furnish; they are impelled to a general intermixture, from a knowledge that it is beneficial; and the benefits to be derived from a change of seeds, are probably only in furtherance of the general design of a community among nations.

But we are yet much in the dark as it respects the best changes of seed, and from what parts of the world they should be brought, to produce the greatest crops. Ought not this to become a matter of more general concern? The Irish farmers sow our flax seed, and find great account in it. Would their flax seed be equally beneficial, when sown here? We have

known flax seed brought from Long Island, and sown in Orange county, which produced nearly double the crop which the common seed there produced. Spring wheat brought from Canada, and sown here (Herkimer county), greatly enhances the crop, but soon degenerates. Siberian wheat yielded largely in this country, for a while. The seeds of apples brought from Europe, will produce trees larger than our own. For roots, it is generally supposed that seeds brought from a more southerly climate are best. Indian corn, brought far from that quarter, will be in danger of ripening too late: that brought far from the north, will ripen too early for a large crop. On the whole, the farmer should make *his* changes as judiciously as possible; and in most instances he will then find the product of his crops much increased.

But in order to prevent seeds from *degenerating by long use*, we are of opinion that the plan pursued by Mr. Cooper, of New Jersey, will be found effectual; though we believe that seeds, improved according to his plan, would undergo a further improvement by a suitable change of place.

His method is to make frequent selections of the most *perfect* plants of every kind, and to cultivate the seeds of these by themselves, for the purpose of raising new and improved stocks of seed of every kind; and further, when he raises seeds of plants, of which there are different *species*, he is careful to set or plant them as much as one hundred yards from each other, in order that in propagating they should not mix breeds, and thus produce spurious or degenerated seeds, partaking more or less of the qualities of each plant.

Seeds are also sometimes susceptible of improvement, by growing *varieties* of the same plants together, for the purpose of obtaining seeds of a medium between the two. But we will further illustrate these matters.

Thus, in making selections in wheat, for instance, search for such heads as have the largest seeds, and the greatest number in each head. In Indian corn, of any particular variety, for stalks of good size, with the greatest number of ears on each, and the ears the largest, most perfect of the kind, and best filled. In flax, for the longest stalks, and such as have at the same time seeds of good size. In pumpkins, for such stalks as bear the greatest number, and these the largest and sweetest. In short, in making the selections take the most perfect and valuable plants to be found, of whatever kind is wanted, and from each of these raise the progeny that is to serve as the stock for seed of the different plants to be cultivated.

In many kinds of plants, such as Indian corn, pumpkins, &c. the selections may be yearly repeated, without any essential inconvenience. In others, such as wheat, barley, &c. yearly se-

lections would be too expensive. In such, let selections be made every eight years; and from the seeds of the plants thus selected, raise a yearly stock sufficient to serve for seed. The more constantly the selections are made, however, the more valuable may the products be expected from such seed.

In regard to the means just mentioned for preventing the degeneracy of seeds, by the intermixture of different species of the same plant, we will state a case. Of the *Brassica* tribe of plants there are different *species*, and also *varieties* of two of these, to wit: cabbages of several varieties, common turnips of several, and the cabbage-turnip, or ruta baga, of which there are no varieties. The cabbages are valuable for their heads or leaves, the common turnip for its bulbous root, and the ruta baga for its bulbous stalk.

Now, if seeds for ruta baga and for cabbages were constantly raised beside each other, the consequence would be, that the bulb of the former would become less, and its foliage more extended; while the head or foliage of the cabbage would lessen, and its stalk become somewhat bulbous. And if all the species and varieties of the plant were constantly grown together, for seed, they would gradually become more assimilated, and the most valuable parts of each, of course, lessened in product.

But sometimes an improvement of seed is to be effected, by growing varieties of the same plant together. Of potatoes, for instance, there are many varieties, some preferable for one particular quality, and some for another; some for greatness of product, and others for mealiness and fineness of taste; and in such case, by growing them together a race is produced, which in part partakes of the good qualities of each.

The same may be observed of many other plants; and in some instances, perhaps, improvements might be made, by blending the most valuable qualities, of plants of different species, together.

Such we conceive to be the doctrine of Mr. Cooper; and we are of opinion, that in general it is well founded. Mr. C. also contends, and we think with much truth, that there is a natural disposition in all seeds or plants, gradually to become habituated to the soil or climate in which they are grown.—(*From the Farmer's Assistant.*)

CHAPTER XX.

ARRANGEMENT OF AGRICULTURAL LABOUR.

To conduct an extensive farm well, is not a matter of trivial moment, or to the management of which every one is competent. Much may be effected by capital, skill, and industry; but even these will not always insure success, without judicious management. With it, a farm furnishes an uninterrupted succession of useful labour, during all the seasons of the year; and the most is made that circumstances will admit of, by regularly employing the labouring persons and cattle at such kinds of work as are likely to be most profitable. Under such a system, it is hardly to be credited how little time is lost either of the men or horses, in the course of a whole year. This is a great object.

As the foundation of a proper arrangement, it is necessary to have a plan of the farm, or at least a list of the fields or parcels of land into which it is divided, describing their productive extent, the quality of the soil, the preceding crops, the cultivation given to each, and the species and quantity of manure they have severally received. The future treatment of each field for a succession of years may then be resolved on, with more probability of success.

With the assistance of such a statement every Autumn, an arrangement of crops for the ensuing year ought to be made out, classing the fields or pieces of land according to the purposes for which they are respectively intended. The number of acres allotted for arable land, meadow, or pasture, will then be ascertained. It will not then be difficult to anticipate, what number of horses and labourers will be required during the season for the fields in culture, nor the live stock that will be necessary for the pasture land. The works of Summer and harvest will likewise be foreseen, and proper hands engaged in due time to perform them.

As nothing contributes more to facility and satisfaction in business, than to prepare for what must be done, a farmer should have constantly in view a judicious rotation of crops, according to the nature and quality of his soil, and should arrange the

quantity and succession of labour accordingly. Team labour, when frost and bad weather do not intervene, should be arranged for some months, and hand labour for some weeks, according to the season of the year. "A general memorandum list of business to be done," is therefore essential, that nothing may escape the memory, and that the most requisite work may be brought forward first, if suitable to the state of the weather.

The following rules, connected with the arrangement and successful management of a farm, are particularly to be recommended:

1. The farmer ought to rise early, and see that others do so. In the Winter season, breakfast should be taken by candle light, for by this means an hour is gained, which many farmers indolently lose, though six hours in a week is nearly equal to the working part of a Winter day. This is a material object, where a number of persons are employed. It is also particularly necessary for farmers to insist on the punctual performance of their orders.

2. The whole farm should be regularly inspected; and not only every field examined, but every beast seen, at least once a day, either by the occupier or some intelligent person.

3. In a considerable farm, it is of the utmost consequence to have labourers specially appropriated for each of the most important departments of labour; for there is often a great loss of time where persons are frequently changing their employments. Besides, where the division of labour is introduced, work is executed not only more expeditiously, but also much better, in consequence of the same hands being constantly employed in one particular department. For that purpose, the ploughmen ought never to be employed in manual labour, but regularly kept at work with their horses, when the weather will admit of it.

4. To arrange the operation of ploughing according to the soils cultivated, is an object of essential importance. On many farms there are fields which are soon rendered unfit to be ploughed, either by much rain or by severe drought. The season between seed time and Winter, may be well occupied in ploughing heavy soils, intended to be laid down with oats, barley, and other Spring crops, by means of the scarifier. On farms where this rule is attended to, there is always some land in a proper condition to be ploughed; and there is never any necessity, either for delaying the work, or performing it improperly.

5. Every means should be thought of to diminish labour, or to increase its power. For instance: by proper arrangement, five horses may do as much labour as six perform according to the usual mode of employing them. When driving dung from the farm yard, three carts may be used, one always filling in the

yard, another going to the yard, and a third returning; the leading horse of the empty cart ought then to be unyoked, and put to the full one. In the same manner, while one pair of horses are preparing the land for sowing turnips, the other three horses may be employed in carrying dung to the land, either with two or three carts, as the situation of the ground may happen to require. By extending the same management to other farm operations, a considerable saving of labour may be effected.

6. A farmer ought never to engage in a work, whether of ordinary practice or of intended improvement, without previously giving it the best consideration of which he is capable, and being satisfied that it is advisable for him to attempt it; but when begun, he ought to proceed with it with much attention and perseverance, until he has given it a fair trial.

7. It is a main object in carrying on improvements, not to attempt too much at once; and never to begin a work, without a probability of being able to finish it in due season.

8. Every farmer should have a book for inserting all those useful hints which are so frequently occurring in conversation, in books, or in the practical management of a farm. Loose pieces of paper are apt to be mislaid or lost; and when a man wishes to avail himself of these for examining a subject previously investigated and discussed, he loses more time in searching for the memorandum, than would be sufficient for making half a dozen new ones. But if such matters are entered in a book, and if that book has a table of contents, or an index, he can always find what he wants, and his knowledge will be in a progressive state of improvement, and he will thus be enabled to derive advantage from his former ideas and experience.

By the adoption of these rules, any farmer will be master of his time, so that every thing required to be done will be performed at the proper moment, and not delayed till the season and opportunity have been lost. The impediments arising from bad weather, sick men, or occasional and necessary absence, will in that case be of little consequence, nor embarrass the operations to be carried on; and the occasion will not prevent due attention to even the smallest concerns connected with his business, on the aggregate of which his prosperity depends.

CHAPTER XXI.

DRAINING.

The operation of draining is performed to free land from an excess of water. Where such excess is allowed to remain, ploughing can only be imperfectly performed, and few of the cultivated crops can be grown with profit. Superfluous water is hurtful in the soil, and also in the subsoil, if it lies within the range of the roots of farm crops, by excluding air and heat, the vivifying influence of which in the soil, is essential to healthy growth, and to the decomposition of vegetable food. If this water comes from springs, its temperature is too cold for cultivated plants; and if it settles from the surface, it stagnates, and becomes deleterious alike to the health of plants and animals. Draining, therefore, is of primary importance upon most of our cultivated farms.

A superabundance of water may arise from various causes, singly or combined, and various methods of draining are practised for its removal.

Where there is a flat or slightly inclined surface, and a tenacious subsoil, of clay or hard-pan, the rains that fall are arrested in their descent by the latter, and produce a cold, wet, uncongenial berth for healthy and vigorous vegetation. The best remedy in this case is under-draining—because it is believed the cheapest and most efficient mode, and causes no waste of land. When this tenacious subsoil is thin, and is underlaid by a porous stratum, the surplus water is often got rid of by boring or sinking pits through the tenacious layer. Pits or wells for this purpose are filled with large stones, and serve as outlets to the drains.

A tenacious subsoil is sometimes disposed in a concave or hollow form, the exterior raised and the centre depressed, so as to retain the water, and form ponds or marshes. These can only be drained by an outlet through their rims, sunk below the level of the basin, into which lateral drains, covered or open, may be made to empty to the extent required.

A tenacious subsoil may overlay a porous one, which is filled with water; and if the strata incline from a horizontal position,

as they generally do, the water from below will frequently burst through the subsoil and become prejudicial to tillage husbandry. The evil here is to be remedied by cutting under-drains through the tenacious subsoil, or by pits through it, by which the water may at once rise and be carried off by drains. A substantial drain across the upper border of a field, will often be sufficient in this way, to lay dry the grounds below.

When both the soil and subsoil are tenacious clay or hard-pan, draining will effect but little benefit, except in preventing the approach of waters from other grounds. Resort must be here had to ridging, or under-drains repeated at intervals of twenty to twenty-five feet.

In many cases springs burst forth in marshy grounds, and spread their waters over a wide extent, without being perceptible to the superficial observer. These should be intercepted at or near the source, so that their waters do not spread and saturate the soil, by sufficient drains, which may be covered, or blind drains, and should terminate in the main drain, or upon a lower surface.

The last cause of a superabundance of water which we shall notice, is that where, originating from springs, it descends from higher grounds and saturates the slope, and perhaps the level at its base, so as to render the ground in a measure unproductive. A porous soil often conceals the water from observation, as it filters through it without coming to the surface, but it nevertheless renders the soil cold and unproductive. These waters should be arrested and carried off by horizontal drains across the slope, as near the source of the springs as practicable; perhaps at intervals below, and also at the base of the slope. These drains should be so deep where it is practicable, as to afford an ample channel for the water in the hard subsoil, as otherwise the water will continue to pass down upon the face of the subsoil, and under the drains. These should be covered drains also, as being more efficient in remedying the evil than open drains, and if well constructed, requiring no repair.

There are some general rules in regard to draining which are to be regarded in all cases.

All drains should be as straight as possible, as this shortens the distance, and renders the sides less liable to be worn, and the waters less apt to be obstructed. They should be made with but a moderate fall, as where the inclination is great, the bottoms are liable to be worn by the water. They should penetrate the subsoil or hard-pan a sufficient depth to contain all the water that comes from above. Open drains should be so large as to contain and carry off all the water that may at any time be required to pass through them. The sides should be sloping

according to the nature of the soil; the more porous and spongy this, the greater slope is required. They should in no case, perhaps, be less than three feet broad at the surface. I never make them less than four. They should be comparatively narrow at the bottom, as, by concentrating the water, the current acquires new force, and carries off the earth and other obstructions which would otherwise accumulate. The sides of all drains should be preserved firm and unbroken, and should be carefully cut with the spade, in the direction desired, and as the digging progresses. The sides of under-drains may be perpendicular, and the breadth of the drain need be no greater than is required for the convenience of the workmen; but such drains should be filled as fast as they are dug out; because, if left open any length of time, the earth is not only apt to fall in, but the sides get into a broken irregular state, which cannot afterwards be well rectified. It also deserves attention, that in most under-drains a proper covering of straw or sod should be put upon the top of the materials, to keep the surface earth from mixing with them.

The pit method of draining, is often effectual when properly executed. When it is sufficiently ascertained where the bed of water is deposited, which can easily be done by boring with a post auger, sink a pit into the place, of a size which will allow a man freely to work within its bounds. Dig this pit through the tenacious subsoil, or of such a depth as to reach the bed of the water meant to be carried off; and when this depth is obtained, which is easily discerned, fill up the pit with big stones, and if the water rises, carry it off by a stout drain to some adjoining ditch or mouth.

Under-drains are constructed of various materials, as stone, brick, tiles, brush, wood, turf, &c. Where they can be had, stones are unquestionably the best material.

Stone drains are of three kinds. A common, but the least efficient mode, is to dig a trench from two to three feet deep, and fill it half full or less, with stones promiscuously thrown in, and then to fill it up with earth. The next method is, to lay at the bottom a regular drain with suitable stones, with an aperture of six or eight inches, upon which six or eight inches of stones are deposited in compact order, and then the trench is filled with earth. This sort of drain is extensively used in Scotland to drain large tracts of wet or boggy ground, and they are sometimes carried to the depth of 16 and 17, and commonly of 4 to 6 feet. An accurate survey is made of the grounds and drains, that in case of obstruction the latter can be readily found. A third mode, and which we particularly recommend, on account of its permanency as well as its cheapness, in all situations where it is practicable, is to use *broken stone* as the draining material. In

constructing these a trench is first dug two feet deep; in the centre of the bottom a narrow sloping spit is then taken out, to be filled up with the broken stone, and carefully cleaned, after which the stone is deposited, and covered either with other stones, straw, brush, or sods, to prevent the loose earth getting into the draining materials. The dimensions of the draining section, a term which we apply to that part filled with the broken stone, may be proportioned to the quantity of water that is required to pass, and the abundance of the draining material. A spade of the intended shape of the drainage section, must be provided to dig it, and also a scraper to smooth the side of the cut, and to take out the loose earth. This spade must be eight to ten inches long, should taper from the upper to the lower end, and possess a strong socket for the handle, and a stout iron pin projecting from it, on which the foot may be placed to drive it into the ground. A spade six inches broad at top, and three or four inches at bottom, is in most cases sufficiently large. The scraper resembles a large pod-auger, with a goose neck and long handle, with which the workman cleans the cut, as he progresses, without materially changing his position. A cubic yard of broken stone, the price for breaking which is ordinarily 62 1-2 cents, will fill about seven yards of a drain of the above dimensions. Under-drains cannot well be constructed in this way, in bog earth or in quicksands: their advantages in a more tenacious stratum, arise from their not being liable to be disturbed by the plough, or the tread of cattle; their affording no harbour for moles; their not being liable to be worn away by the attrition of the water which passes in them, or choked up by water and earth from the surface. These drains possess no large cavities; and the water rather filters than runs through them.

Straw drains are sometimes employed, where better materials cannot be had. They are formed somewhat like the preceding, except that the under cut should not be above three inches at top, and one inch, or one and a half inches broad at bottom,—and that a rope of straw, of adequate size, instead of broken stone, is employed to fill them. To give strength to a spade of the required dimensions, it should be made rounding on one side. The straw will fill only five or six inches of the cut, leaving an aperture below for the water, of three or four inches. If there is a constant run of water, it will, as its force is concentrated in the narrow bottom, generally keep it free from all obstructions.

The sod taken from the surface of the ditch, should be preserved and laid in upon the straw rope. The expectation is, that before the straw has decayed, the earth upon it will have become so compact as not afterwards to settle and close the drain.

In some parts of England sods are substituted for straw, in

which case they are cut from 12 to 18 inches in length, and are set in with the grass side downwards, and pressed in as far as they will go. I last year employed straw in draining some acres of wet springy land, in the manner above described, much of which had before been too wet for the plough, and even for the better grasses. Upon the field I have this season planted corn and potatoes, and the crop is very promising. The draining cost about 9 cents the rod.

Brush drains are made in different ways. Faggots, tied in bundles of a proper size, are sometimes laid in the bottom, to the thickness of one or two feet. At other times, the trench being dug with shoulders like that intended for straw, short sticks are laid across the lower aperture, and the brush then laid in. Our practice has been to take dwarf pine, the buts from three to six inches, cut them into lengths of four or five feet, and commencing at the upper end of the drain,* proceed to lay them in regularly and compactly, the buts downward, in a sloping form, until the drain is filled. The trench is then apparently full. The brush are then brought within the edges, smartly trod down, and the earth filled in. *Brush drains should be sunk so deep as to have the brush, when pressed upon by the earth, below the reach of the plough at least six inches*, otherwise they are liable to be disturbed and choked by loose earth. *The brush should be used in a green state*, and with the leaves upon it if practicable, as in this condition it lasts much longer.

A mode of draining clay soils wet by rain or surface water, practised by Sir H. Fletcher, is thus described in the New Edinburgh Encyclopædia. "The upper soil is of good quality; but being situated in a mountainous part of the country, the frequent rains kept it so full of water, that it produced only a coarse grass worth 3s. per acre. The inferior soil of clay was of great depth. On grass lands he digs 22 inches or 2 feet deep; the first spadefull is of turf, taken as deep as where it separates from the clay; the turf is dug carefully out and preserved unbroken, with its grass side up, and laid on one side of the cut; then, with a very strong spade, 18 inches long, 6 inches wide at the top and 2 at the bottom, he digs a spadefull in the clay, which the men spread about the land, on the side of the drain opposite to which the turfs were laid, as far as possible from the drain, so that none may get in again. A scoop follows to clear out the fragments in the bottom, which are also spread in like manner. They are then ready for filling; and in doing this, he takes three stones of a thin flat form, two of which are placed against the sides of the drain, meeting at the bottom; and the third caps the other two. Thus a hollow triangular space is left to convey the water, which is subject to no accidents that can fill it up, or impede the

current. Stones always sink deeper in the ground; and in the common method, this frequently causes stoppages, by their being partly buried in the clay; but the triangle, when it subsides, does it regularly, and keeps its form, and the passage for the water clear. One cart load of stones in this way will do a considerable length of drain. They are carefully laid down by the side of the cut, with a shovel or basket; and if there are any small refuse stones left on the ground after the drain is set, they are thrown in above. The stones being thus fixed, the sods are then trimmed to the shape of the drain, and laid on them with the grass side downwards, and none of the clay used in filling up."

With regard to the duration of hollow drains, or the length of time that the water will continue to flow in them, and preserve the soil in a proper state of dryness, it must necessarily depend in a great degree, upon the nature of the materials with which they are filled, and the care that has been taken to prevent their being choked up by any soft soil. Independent of this last circumstance, a drain filled with stones, like the channel which supplies a natural spring, may endure forever. Wood perishes at certain periods according to its nature; but it does by no means follow that the drain should lose its effect in consequence of the destruction of the wood. If the earth over it form itself into an arch, the water will still continue to flow. Accordingly, drains filled with bushes and straw have been known to run well after forty years.—*Cultivator.*

CHAPTER XXII.

IRRIGATION.

Water is employed in various ways for the improvement of land, 1. By the process of what is strictly called irrigation, when water is made to trickle over the surface; 2. By flooding, when it covers the soil more completely for a period of time; and 3. By warping, when the water acts merely as a conductor of the *warp* or mud by which the improvement is effected.

Irrigation.—It is generally supposed that watering land is only calculated for encouraging the production of grass; but irrigation is likewise applicable to the culture of grain, and has even been made use of for promoting the growth of timber.

Grass.—There are four modes by which water promotes the amelioration of grass lands. It preserves a favourable degree of temperature; improves the crop by the nourishing substances it conveys; destroys weeds, which delight in a dry soil; and as a mere element it is beneficial, more especially in dry seasons.

Water likewise conveys other substances to the soil, by which it is enriched. This is obviously the case when land is irrigated by muddy waters, which leave behind them rich mould, and other substances. If lime or marl be held in solution, the waters become highly enriched. Other soluble and nutritive substances are also capable of being conveyed by water in the same manner, on passing through fertile tracts.

Meadow plants cut green, without any external moisture on their stalks or leaves, and afterwards dried, loose by drying from 66 to 70 parts out of 100. This very large proportion of moisture (though water is perhaps not the only substance carried off), is a direct proof that water itself enters largely into the composition of these vegetables. Water is likewise of use, by the more equable diffusion of nutritive matter in the soil, which it necessarily occasions.

The system of watering land, however, can never be carried to perfection, unless accompanied by draining and inclosure.—Stagnant water and impetuous torrents, do essential injury; but

if water is entirely under command, so that it may be laid on or taken off at pleasure, it may become a most useful instrument in the hands of a skilful husbandman. Draining is therefore a necessary preparation for irrigation.

With respect to inclosure, it can be of little real use to water lands, unless they are previously secured by suitable fences from poaching and trespass. Indeed, these are necessary, not only for the advantage of the grass, but for the safety of the stock, as sheep cannot be suffered to resort to fields flooded in Summer, from the risk of rot.

Grain.—In the East Indies, not only rice, but wheat and barley, are raised by means of irrigation; and it has long been practised in some parts of Scotland, to enrich the soil for crops of grain by the same means. An instance is mentioned, where by following this practice for nearly fifty years, the success was so great, that an inclosure which had got into an exhausted state was so enriched by it, that it preserved an uncommon degree of fertility for a succession of crops (one of them wheat), without fallow, lime, or marle, and with very moderate assistance from dung. The common method was very different: after watering for one or two seasons, they ploughed for oats, and by taking two or three successive crops the soil was exhausted, and run out into weeds and poverty. Nothing else could be expected from such management. But in other parts of Scotland, irrigation was not only practised with considerable success, and for crops of grain, but immense quantities of wild oats, formerly prevalent, were completely extirpated, and for the destruction of which no means were known previous to the introduction of fallowing and of green crops. Water alone, however, without the addition of other substances, will not bring grain to perfection. Hence, though from year to year it may be applied to meadow and pasture grass with success, yet it cannot be repeated with advantage to grain, except at considerable intervals of time, accompanied with manure.

The system of irrigating for grain seems likewise to have succeeded in Somersetshire, England, where a large tract of country, suffered to remain in pasture for two years, was at stated intervals during that time regularly flooded by a stream descending from the adjacent hills. It was then subjected to the following rotation of crops; 1, wheat on the ley; 2, turnips; 3, barley and artificial grasses. The produce of grain was very considerable, namely, wheat from forty to fifty bushels, and of barley from fifty to sixty bushels per acre. In a late publication on the utility of water-meadows, a question therefore is not improperly put, whether upon particular soils and under certain circumstances, irrigation might not produce the same effects upon wheat

and several other plants of the field and the garden, as upon herbage? The author adds, no good reason can be assigned why this valuable improvement should be restricted to the cultivation of grasses.

Trees.—It is recorded in the statistical account of Scotland, that irrigation was in one instance used for a very singular purpose: water was conducted through a plantation of young trees, and it was found, that when done with judgment it was the most effectual and cheapest mode of encouraging their growth. To the alder, the willow, and even the birch and the ash, it may be of use; unless in very dry soils, however, it must be dangerous to forest trees.

But on the whole, the improvement of grass seems to be the great object to which the watering of land is applicable.

Manner of conducting the work.—There are two methods of doing this: by *flowing*, calculated for a flat country; and *catch-work*, for sloping grounds.

By the first method, *flowing*, where the ground is flat, the soil is formed into beds or broad ridges. They are commonly from 30 to 40 feet wide, and 150 or 160 feet in length, as in such situations the great object is, when once brought on, to be able to carry the water quickly off. Hence it is necessary to throw up the land in high ridges, with drains between them. More of the failures in irrigation arise from the ridges not being sufficiently high, and the slopes sufficiently steep, than from any other cause.

The other method, *catch-work*, is somewhat difficult to describe. To be properly understood, the operation must be seen. It may, however, in general be remarked, that the system is calculated for sloping grounds; and that after the water is brought from the original stream into a new cut, it is stopped at the end on as high a level as the case admits of, by which the water is made to fill the trench, and run over at the side, and flood the land below it. But as the water would soon cease to run equally, and would wash the land out in gutters, it has been found necessary to cut small parallel trenches, at the distance of from 20 to 30 feet, to *catch* the water again (hence the origin of the name), and the same plan of spreading or diffusing it continued, until the water reaches the main drain at the bottom of the meadow. It is a great advantage attending this system, that it is not only less expensive, but the same quantity of water will do much more work.

In either of these ways, irrigation materially promotes the growth of grass. The herbage of dry land is impoverished from the want of water—that of wet land, by its remaining stagnant; but both these evils are remedied by the above processes.

Preliminary considerations.—The first point to be ascertained

is, whether there be a sufficient quantity of water at command. For want of due attention to this important circumstance, mistakes have sometimes been made, extremely prejudicial to the advancement of irrigation. The next objects are, the quality of the water, and the nature of the soil and subsoil of the land proposed to be irrigated.

It is then proper to consider, *how* and *where* the water can be taken out of the stream. This can only be done by a proper level.

Irrigation being an operation requiring considerable nicety and skill, cannot be advantageously conducted without attentive hands to form the soil, to lay on and shift the water, and remove it, and to perform all the necessary operations of the process.

Water calculated for irrigation.—Clear spring water, in the state in which it issues from the hills (more especially where the strata are calcareous), is certainly of a fertilizing quality. It is charged with a certain quantity of vital air; near the source, also, it is usually warmer than other waters, and thence it answers better for irrigation. From these properties there is always produced abundance of early succulent grass, for several yards where the water first runs over the land near the spring. Clear spring water may also be used longer than muddy, being less apt to render the grass gritty and unwholesome; hence some give a decided preference to clean-watered crops.

Mountain streamlets, fed principally by springs, are more at command than rivers, and more convenient to be directed over slopes, and are also better calculated for improving grass.

Where river water is accessible, it is commonly loaded with many enriching substances from the country towns and villages through which it passes, and is thus productive not only of temporary but permanent improvement.

Sea water, also, where it can be employed for that purpose, in moderate quantities, or made use of within embanked marshes, is applicable to the purposes of irrigation. It contains, more especially near the land, not only animal and vegetable substances, but also saline mixtures in solution. The utility of salt marshes to diseased horses, and their acting as a restorative to sheep in danger of or infected by that fatal malady, the rot, is well known.

In regard to waters much impregnated with iron, they were formerly supposed totally unfit for the purposes of irrigation; but it is now fully proved, by the accurate experiments of an able chemist, that ferruginous waters are friendly to vegetation, when properly applied. Chalybeate springs, however, or water impregnated with other mineral substances, as lead or copper, never does good; and it is well known, that waters of that de-

scription, after they have been brought into fields by levels cut at a considerable expense, have again been diverted, and allowed to flow in their original channels.

Waters that are impregnated with the juices that flow from peat mosses, are considered by many not worth applying to the soil. It is objected to them that they are soon frozen; that they convey no material nutriment; and that they are commonly loaded with such antiseptic substances, as will retard instead of promoting vegetation. It is urged on the other hand, that the want of sufficient slope in the meadow, or of proper management in regard to the water, may have occasioned the disappointment experienced in some cases, when bog waters have been applied.

Soil and subsoil.—Irrigation is not restricted to any particular soil. Land naturally wet may be greatly improved by it, when accompanied by draining; and it is equally beneficial to that which is dry.

Rich loams produce the largest crops, even though the waters be not of the first quality. Peat bogs, when properly drained, will likewise yield good crops. Irrigating adhesive clays is expensive, and the beneficial effects from it do not soon appear; but it is evident from experience, that even this sort of land may, by good management, be thus rendered more fertile.

Barren slopes may be advantageously improved under the catch-work system; and in this way much land otherwise unproductive may be rendered productive of hay or very valuable grasses. The most suitable soils, however, are those of a sandy or gravelly nature, more especially when they can be irrigated by muddy streams, the sediment of which corrects their excessive openness. Indeed, by means of the warm and rich waters of a low, fertile, and populous district, impregnated with mud, and containing animal or vegetable manures, almost any soil may be converted into a rich meadow.

The bottom or subsoil of a water meadow, is of more consequence than even the quality or depth of the soil. A loose gravel, or bed of broken flint, with little or no intermixture of earth, is the most desirable subsoil.

Effects of climate.—The process of irrigation seems to be attended with much more beneficial effects in warm than in cold climates.

Grasses best adapted to water meadows.—Where the catch-work system is adopted, the surface of the meadow is rarely much broken: the natural grasses in the ground are trusted to, and it is seldom necessary to procure any seed, except for bare or vacant spots. When ridges, however, are formed by the spade or plough, they are generally destitute of grass when first laid down. It is necessary, therefore, to sow the seeds of such

grasses as are best calculated to produce abundant crops. The most usual are *perennial red clover*, cow or marl grass; the rough stalked meadow grass; and the crested dog's tail. Timothy is greatly preferred here; and in boggy lands, fiorin is found peculiarly productive in that species of soil. Where the object is pasture, rather than hay, white clover, rye grass, and the meadow fox-tail, ought not to be omitted. The soil of itself, when watered, will produce grasses the most congenial to the state of the land, and the degree of moisture applied to it; but a little manure at the commencement of irrigation by beds (unless the turf has been hard and preserved to be put upon the surface), is thought by some desirable. In short, the superior grasses in general will thrive under irrigation.

Hay from water meadows.—The grass of water meadows, being frequently large and coarse in its nature, it is advisable to cut it young, and then, if it be well made, the hay is of a nourishing and milky quality, either for ewes or dairy cows. It has likewise been given to horses, and when properly made, they thrive upon it.

It is, however, proper to observe, that from the great succulence of herbage, the making of hay from water meadow requires a very considerable degree of attention; and that when the grass from which it is made has been over watered or rendered impure by scum or mud, or when the hay has been ill made in the fields or injured in the stacks, it will be hurtful to any stock to which it is given; but that altogether originates from mismanagement, and it has been found by experience, that cows, if they do not fatten so well, yet give much more milk from hay produced by irrigation, when eat early, and thence having much softness and succulency, than from any hay produced from grass lands, that had not been irrigated.

Advantages of irrigation.—Where the situation is favourable, the following benefits result from the practice of irrigation:—1st. With the exception of warping, it is by far the easiest and most certain mode of improving poor land, particularly if it is of a dry and gravelly nature. 2. When once improved by irrigation, it is put in a state of *perpetual fertility* without any occasion for manure, or trouble of weeding, or any other material expense. 3. It becomes so productive as to yield the largest bulk of hay, besides abundance of the very best support for sheep in the Spring, and for cows and other cattle in the Fall. 4. In favourable situations, it produces very early grass, in the Spring when it is doubly valuable; and 5. Not only is the land thus rendered fertile without having any occasion for manure, but it produces food for animals which is converted into manure, to be used on other lands, thus augmenting in a compound proportion, that great source of fertility.

Flooding Land.—The mode of improvement by flooding, is when the land is overflowed or drowned by a quantity of water from a stream or lake; by means of which (if it takes place in a favourable season) the future production of crops both of grass and grain, is promoted. It differs from irrigation, in which the water ought always to be in a *flowing state*, whereas in the process of artificial flooding, it is wholly or nearly stagnant. The object of this process is, 1. To admit the water without any injury to the surface of the soil from the force of the stream that is admitted; and 2. To withdraw it in such a soft and regular manner, that none of the mud deposited on the surface shall be taken away.

From the advantageous consequences of flooding, when done by nature, there is reason to think that the same benefit would result from it when artificially executed. But this of course could only be done where there is a command of water, and an opportunity of stemming it up, so as to overflow the whole surface. It should be done in the Summer season, and with water that does not contain any deleterious substance.

Warping Land.—This is a process by which tide waters, which hold alluvial matters in suspension, are confined with a view of procuring their deposit on the land. But as this is a process not very likely to be much practised, we shall not enter into any details on the subject.

In conclusion of this chapter we give from Doctor Spofford's Essay on Irrigation, presented to the Essex Agricultural Society, Mass., the following facts:

"Several years ago, when resident with my father at his farm at Rowley, I laboured hard to divert a stream which fell into a miry swamp, from its usual course across a piece of dry upland. The stream was pure spring water, which issued between the hills about fifty rods above, running but just far enough to acquire the temperature of the atmosphere, but without receiving any more fertilising quality than was obtained in passing through a pasture in a rocky channel. The same stream I again diverted from its course about forty rods below, after it had filtered through a piece of swamp or meadow ground, and with the same effect; and again still lower down its course, I succeeded in turning it into a piece of high peat meadow, which had usually produced but very little of any thing; and the effect was that more than double the quantity of grass was produced, and that of a much better quality. I was led to this latter experiment by observing that a strip of meadow which naturally received the water of this run, and over which it spread for several rods in width, without any particular channel, was annually much more productive than any other part of the meadow.

"But the best experiment and on the largest scale of any which I have known, was made by my father-in-law at Jaffrey, N. H. The experiment was commenced as early as the year 1800, and continued until 1820. The last ten years of the time he flashed perhaps 20 acres; and it produced twice as much in common seasons, and three times as much in dry ones, as it would have produced without watering. This land would hold out to yield a good crop twice as long as other land of the same quality (that is, I presume without flowing). In dry weather he watered it every night, and the produce was good.

"I am acquainted with the lot of land which was the subject of this experiment. It is a northern declivity, and rather a light and sandy soil, on the eastern bank of Contookook river, and the water used was that of the river.—About one mile below its formation by the junction of two streams, one from a large pond of several hundred acres, in Rindge, and the other a mountain stream, formed by innumerable springs issuing from the skirts of the Monadnock.

"From the foregoing premises may we not conclude, that water performs a more important office in the growth and formation of plants than has generally been supposed; and that it not only serves to convey nourishment, and thereby constitutes the solid substance; and we may further conclude that every farmer should survey his premises, and turn those streams, which are now often hurtful or useless, on to lands where they are capable of diffusing fertility, abundance, and wealth."

It appears further, that the immense fertility of Egypt is not so much owing to the alluvial deposit brought down by the annual inundation, as to the canals and reservoirs in which the waters are retained, to be spread over the lands during the succeeding drought, at the will of the cultivator.

If, according to the experiments of Boyle and Von Helmont, almost the whole food of plants is derived from water, then the principal use of the various manures is to attract moisture, and to stimulate the roots of plants to absorb and elaborate it; and we have also reason to think that lands are much more injured and impoverished by naked exposure to heat and wind, and washing by water that runs off and is lost, than it is by producing abundant crops.

In the present state of population, nothing more would be expected or desired than that every farmer should make use of such means as the small streams in his vicinity may afford; but in a densely peopled country, like Egypt in former ages, or China at present, it should doubtless be one of the first enterprises of a good government, to take our large rivers above their falls, and turn them off into canals for the benefit of agriculture.

CHAPTER XXIII.

DRILL HUSBANDRY—MOWING—HAY-MAKING—PLOUGHING.

Drill Husbandry.—There is no doubt that the culture in rows is best calculated for leguminous or green crops; but the question whether it is most expedient or profitable to raise culmiferous crops according to the broadcast or drill system, has agitated the agricultural world for a number of years; and as it is a point respecting which there still exists a great diversity of opinion, we shall here merely give an account of the manner in which the operation of drilling is performed, for the benefit of such as may be disposed to try the experiment.

The operation of drilling is performed by a machine, of which there are several. Among others calculated for row-culture, the drill barrow ought not to be omitted. It is a very simple machine, and may be used in two ways; 1. Either a box or barrow is attached to the plough, by which the seed is deposited in the furrow, as the plough goes along, and is covered by the next furrow slice; or 2. A boy with a barrow follows the plough, depositing the seed in the bottom of the furrow, which of course is completely covered by the next furrow slice. This is easily effected even in windy weather. The furrow slice ought to be from two to three inches deep in strong land, and from three to four in light. The crop should be hand-hoed when a drilling machine is not made use of.

The rows may be either ten or fourteen inches distance, but ten inches is considered sufficient by the generality of farmers, more especially where hand-hoeing is adopted. It is easy with a plough to make a furrow about ten inches wide; but when it is proposed to have a furrow of fourteen inches, it is necessary to have two ploughs with narrow bottoms, to follow one another, each making a furrow of seven inches broad.

Mowing.—They who have not been in their youth accustomed to do this work, are seldom found to be able to do it with ease or expedition. But when the art is once learnt, it will not be lost.

As this is one of the most laborious parts of the husbandman's calling, and the more fatiguing as it must be performed in the hottest season of the year, every precaution ought to be used which tends to lighten the labour. To this it will conduce not a little, for the mower to rise very early, and be at his work before the rising of the sun. He may easily perform half the usual day's work before nine in the morning. His work will not only be made easier by the coolness of the morning air, but also by the dew on the grass, which is cut the more easily for being wet. By this means he may lie still and rest himself during all the hottest of the day, while others who begun late are sweating themselves excessively; and hurting their health, probably, by taking down large draughts of cold drink to slake their raging thirst. The other half of his work may be performed after three or four o'clock, and at night he will find himself free from fatigue.

If the mower would husband his strength to advantage, he should take care to have his scythe, and all the apparatus for mowing, in the best order. His scythe ought to be adapted to the surface on which he mows. If the surface be level and free from obstacles, the scythe may be long and almost straight; and he will perform his work with less labour, and greater expedition.—But if the surface be uneven, cradley, or chequered with stones, or stumps of trees, his scythe must be short and crooked. Otherwise he will be obliged to leave much of the grass uncut, or use more labour in cutting it. A long and straight scythe will only cut off the tops of the grass in hollows.

A mower should not have a snead that is too slender; for this will keep the scythe in a continual tremor, and do much to hinder its cutting. He must see that it keeps perfectly fast on the snead; for the least degree of looseness will oblige him to use the more violence at every stroke. Many worry themselves needlessly by not attending to this circumstance.

Mowing with a company ought to be avoided by those who are not very strong, or who are little used to the business, or who have not their tools in the best order. Young lads, who are ambitious to be thought good mowers, often find themselves much hurt by mowing in company.

Mowers should not follow too closely after each other, for this has been the occasion of fatal wounds. And when the dangerous tool is carried from place to place, it should be bound up with a rope of grass, or otherwise carefully secured.

Mr. de Lisle introduced in England, the mowing of wheat.—The method is this: The scythe he uses is at least six inches shorter in the blade than the common scythe; and instead of a cradle, has two twigs of osier put semi-circularwise into holes made in the handle of the scythe, near the blade, in such a manner that one semi-circle intersects the other.

By this method of mowing wheat, the standing corn is always at the left hand. The mower mows it inward, bearing the corn he cuts on his scythe, till it comes to that which is standing, against which it gently leans. After every mower, follows a gatherer, who being provided with a hook or stick, about two feet long, gathers up the corn, makes it into a gavel, and lays it gently on the ground. This must be done with spirit, as another mower immediately follows.

As reaping is slow and laborious work, it would be right for our countrymen to learn this method of mowing their wheat; which will undoubtedly answer also for other sorts of grain.

Hay-Making.—The first thing to bo considered about hay-making, is the time of cutting the grass. It should not be cut too early, or before it has got its growth, for this will cause it to shrink too much in drying. On the contrary, it should not stand too late, or till the seed be quite ripe. It is not only harder to cut, but the ripeness of the seed will cause it to shatter out while drying, which will be a considerable loss, as the seed is the most rich and nourishing part; and the soil will be the more exhausted by nourishing the seed till it comes to maturity, and the next succeeding crop will be the poorer. There never can be any advantage in mowing late, unless it be thickening the grass roots, by scattering some of the seed, where they were before too thin.

He that mows early has the advantage of longer days for drying his hay; and of shorter nights, when the dews are less detrimental to hay-making.

But the farmer who has many acres of the same kind of grass, cannot always expect to cut the whole of it in exactly the right season. That he may approach as near to right as possible, he should cut the thickest grass first of all; especially if it be in danger of lodging, or so thick that the lowest leaves perish, or the bottoms of the stalks turn yellow. The thinnest of his grass should be cut next, which is apt to be ripe soonest; and last of all, the middling sized grass, or that which is on a medium between thick and thin.

Where a second crop is expected the same year, thick grass should be cut a little earlier, that the roots may not be injured so much as to prevent their speedy recovery, by boing closely covered too long by the first crop.

Some regard should be had to the weather, when the time of cutting is in contemplation. Those, especially, should regard it, who are able to call in as much assistance as they please in hay-making.

Grass, which has not been washed by rain for several days, has a kind of gum on it, which is known by its adhering to the scythe.

This gum is thought to be a benefit to the hay; and the farmers are fond of mowing their grass when this gum appears, rather than just after the grass has been washed by rain.

As to the drying of hay, or the manner of making it, I know there are a variety of opinions. The right way is to do it in such a manner that as much of the sap as possible may be retained, and in the best state that is possible. In this I should think all would agree. All persons will allow that too much drying is hurtful. It is certainly a loss to rake it, or stir it at all, when it is so dry that the leaves will crumble. And doubtless as much of the sap should be retained as is consistent with its being kept in good order for fodder, and for long keeping.

Some grasses will keep well with less drying than is needful for others. The Rhode-Island bent, as it is called, or red-top grass, will do with less drying than some other grasses. It has been much practised to put up with so little drying that it heats in the mow to so great a degree, as to make it turn brown like tobacco; and it is known that cattle will eat it well, and thrive on it. But the mow will certainly send out part of the virtue of the hay in steams. I cannot but think that all grasses should be so much dried, that the mows and stacks, though they have a degree of heat, should not emit any sensible steam; and I would not wish to have hay made brown by mow.burning. It surely does not appear to so good advantage at market.

Were it not for the labour and cost, a good way of hay-making would be, for the hay-makers to follow at the heels of the mowers, at least as soon as the dew is off, and spread the swarths evenly; turn the grass about the middle of the same day; make it up into cocks before night; open the hay, and turn it the next day; and so on till it be sufficiently dried, doubling the cocks if signs of rain appear. It will not commonly take more than two or three days to dry it, unless it be very green, or uncommonly thick and rank. A person who has but little hay to make, need not be much blamed, if he do it in this way; especially if the weather do not appear to be settled.

The practice of the best English, Flemish, and French farmers, is to expose the hay as little as possible to the sun. It is carried in dry, but it preserves its green colour; and you see hay two or three years old in their market, of so bright a green colour, that we should scarcely conceive it to be cured. Yet they are in the practice of preserving it for years, and value it more for its age. If such a course be best in climates so cool and cloudy, how much more important would it be under our scorching Summer suns.

But if the weather be unsettled, or if showers be frequent, it may be better to spread grass well, as soon as it is mowed, stir it often, cock it the same day it is mowed, open it in the next fair

day when the dew is off, let it sweat a little in cock, and house it as soon as it is dry enough. It will bear to be laid greener on a scaffold, than in a ground mow; and in a narrow mow greener than in a broad one. And that which is at least of all made, should be put upon a scaffold.—*Deane*.

"Having observed," says Hayward's Science of Agriculture, "that in a season when there was no rain whatever, and the hay had been made with rapidity, and carted within a short time after it had been cut, that a greater quantity was destroyed and injured by being overheated and burnt, than in a catching irregular season; that when hay had not heated in the stack, it is frequently mouldy; that as hay lost its native green colour, and approached a brown, it lost its nutritive qualities; and that altogether the making of hay, as usually conducted, was a very precarious and teasing operation; I determined on trying to arrange a system on some more regular and certain principles, in which I succeeded; and by adopting a certain and regular course of operations, was enabled to make my hay of a uniform good quality; and, let the weather be as it might, at a regular expense of labour. And considering such a process not only of importance, as it insures a more perfect quality, but as it affords a more certain protection against the injuries usually consequent on the uncertainty of the weather, and overheating in the stack, and that it thus removes two great causes of anxiety, it may be well worth the public attention.

"In the first place, as to the state of the weather, it generally happens at this season of the year that there are three or four days dry; therefore on beginning to cut the grass, as it is well known that during wet weather grass may be cut, and suffered to remain in the swarth for several days without injury; and it being desirable, where hands are plenty, to have a good quantity, or so much as will complete a stack in a day, in the same state of forwardness, I should prefer beginning to cut during the rainy weather; however, be this as it may, swarths should not be opened but on a certain fine day; and when this is done, the grass should be well shaken apart and equally spread over the ground. As soon as the upper surface is dry turn it well over; and in this operation great care should be taken to open and spread any cocks that may not have been divided in the first opening. This being done, commence raking into wind-rows, in time that the whole may be made into small cocks before night. *The second day these cocks must remain untouched, let the weather be wet or dry*; the third day if the weather be certain and fine, throw the cocks open: but if the weather be wet and threatening, they may remain another day, or until the weather is certain to be fine for the day. The cocks should then be thrown, according to the

crop, into beds of two or three rows; and after three or four hours' exposure, turned over; and taking time to gather the whole into wind-rows and cocks before night, let this operation commence accordingly, *and none be left open*; the day after this, which in fine weather will be the fourth, *the cocks must again remain untouched, or not be opened, whether the weather be wet or dry.* On the fifth or next day, these cocks will only require to be opened for an hour or two, when they will be fit for the stack. The novelty of this mode consists only in suffering the hay to remain in the cock the second and third, or alternate days; and at first sight it may appear that so much time in fine weather must be lost, but this is not the case. Whilst the hay remains in cocks, a slight fermentation, or what is termed sweating, will take place, and in consequence, after it has been opened on the third and fifth days, it will prove to be just as forward as if it had been worked every day. And the advantages resulting from this, are, obviously, the following: by shortening the time of open exposure, the colour of the hay is more perfectly preserved, and consequently the quality: and the fermentations or sweatings which take place in the cocks, proved so much to have diminished that principle, or inclination to prevent its heating injuriously in the stack; and the whole operation of making, whether it takes four days or eight, requires three days labour only; and the hay being left in that state every night, in which it is the least possibly exposed to the injuries of the weather, and in which it may remain for a day or two in uncertain weather without injurious exposure, much painful anxiety and useless attendance of labourers are obviated."

PLOUGHING.—Ploughing is justly considered the most important of agricultural operations, as on the manner in which this is performed, depends the facility of executing all succeeding operations on the same piece of land. The manual operation of holding the plough in a proper position, and directing the horses or cattle which draw it at the same time, is only to be acquired by experience; when once attained it is perhaps one of the most agreable and healthy of agricultural exercises, the body being kept upright, the arms and legs being brought into action, and also the eye and the mind, to keep the furrow straight, and of regular width and depth, and the voice to speak to the horses.

Three different points require particular attention in ploughing: 1st, The breadth of the slice to be cut; 2d, its depth; and 3d, the degree in which it is to be turned over; which last circumstance depends both upon the construction of the plough, particularly the mould-board, and the care of the ploughman.

The breadth and depth of the furrow slice are regulated by ju-

diciously placing the draught on the nozzle or bridle of the plough; setting it so as to go more or less deep, and to take more or less land or breadth of slice, according as may be desired. In general, the plough is so regulated that, if left to itself, and merely kept from falling over, it would cut a little broader and a little deeper than is required. The coulter is also placed with some inclination towards the left or land side, and the point of the soc or share has a slight tendency downwards.

The degree to which the furrow slice turns over, is in a great measure determined by the proportion between its breadth and depth, which for general purposes, is usually as three is to two, or when the furrow is nine inches broad it ought to be six inches in depth. When the slice is cut in this proportion, it will be nearly half turned over, or recline at an angle of forty or forty-five degrees; and a field so ploughed will have its ridges longitudinally ribbed into angular drills or ridgelots. But if the slice is much broader in proportion to its depth, it will be almost completely overturned, or left nearly flat, with its original surface downwards; and each successive slice will be somewhat overlapped by that which was turned over immediately before it.— And finally, when the depth materially exceeds the width, each furrow-slice will fall over on its side, leaving all the original surface bare, and only laid somewhat obliquely to the horizon.

Ploughing with the breadth and depth nearly in the proportion of three to two, is best adapted for laying up stubble land after harvest, when it is to remain during winter exposed to the mellowing influence of frost, preparatory to fallow or turnips.

The shallow furrow of considerable width, as five inches in depth by eight or nine wide, is understood to answer best for breaking up old leys, because it covers up the grass turf, and does not bury the manured soil.

Ploughing with the depth of the furrow considerably exceeding the width, is a most unprofitable and uselessly slow operation. which ought seldom or never to be adopted.

The most generally useful breadth of a furrow-slice is from eight to ten inches, and the depth ought to be seldom less than four inches, except in soils uncommonly thick and fertile. When it is necessary to go deeper, as for carrots and some other deep rooted plants, a trench ploughing may be given by means of a second plough following in the same furrow.

Shallow ploughing ought always to be adopted after turnips are eaten on the ground, that the manure may not be buried too deep; and also in covering lime,—especially if the ground be pulverised by fallowing, because it naturally tends to sink in the soil. In ploughing down farm-yard dung, it is commonly necessary to go rather deep, that no part of the manure may be left exposed

to the atmosphere. In the first ploughing for fallow or green crops, it is advisable to work as deep as possible, and no great danger is to be apprehended, though a small portion of the sub-soil be at that time brought to the surface.

The furrow-slices are generally distributed into beds varying in breadth according to circumstances; these are called *ridges* or *lands*, and are divided from one another by gutters or open furrows. These last serve as guides to the hand and eye of the sower, to the reapers, and also for the application of manures in a regular manner. In soils of a strong or retentive nature, or which have wet close sub-soils, these furrows serve likewise as drains for carrying off the surface water, and being cleared out, after the land is sowed and harrowed, have the name of *water-furrows*.

Ridges are not only different in breadth, but are raised more or less in the middle, on different soils. On clayey retentive soils, the great point to be attended to is the discharge of superfluous water. But narrow ridges or *stitches* of from three to five feet, are not approved of in some of the best cultivated counties. In these a breadth of fifteen or eighteen feet, the land raised by two gatherings of the plough, is most commonly adopted for such soils; such ridges being thought more convenient for manuring, sowing, harrowing, and reaping, than narrower ones; and the water is drained off quite as effectually.

Ridges on dry porous turnip soils, may be formed much broader; and were it not for their use in directing the labourers, may be, and sometimes are, dispensed with altogether. They are often thirty, or thirty-six feet broad, which in Scotland are called *ban win* ridges, because reaped by a band of shearers, commonly six, served by one binder. If it be wished to obliterate the intermediate furrows, this may be done by casting up a narrow ridgelet, or single bout ridge, between the two broad ridges, which is afterwards levelled by the harrows.

The mode of forming ridges straight, and of uniform breadth, is as follows: let us suppose a field perfectly level, that is to be laid off into ridges of any determinable breadth. The best ploughman belonging to the farm conducts the operation, with the aid of three or more poles shod with iron, in the following manner: the first thing is to mark off the head ridges, on which the horses turn in ploughing, which should in general be of an equal breadth from the bounding lines of the field, if these lines are not very crooked or irregular. The next operation, assuming one straight side of the field, or a line that has been made straight, as the proper direction of the ridges, is to measure off from it with one of the poles, half the intended breadth of the ridge, if it is to be gathered, or one breadth and a half if to be

ploughed flat: and then the ploughman sets up a pole as a direction for the plough to enter. On a line with this, and at some distance, he plants a second pole, and then in the same manner a third, fourth, &c. as the irregularity of the surface may render necessary, though three must always be employed,—the last of them at the end of the intended ridge, and the whole in one straight line. He then enters the plough at the first pole, keeping the line of poles exactly between the horses, and ploughs down all the poles successively; halting his horses at each, and replacing it at so many feet distant as the ridges are to be broad; so that when he reaches the end of the ridge, all his poles are again set up in a new line parallel to the first. He returns, however, along his former track, correcting any deviations, and throwing a shallow furrow on the opposite side of his former one. This mode has a decided preference over the common practice, of laying the two furrows first towards each other. By first throwing them from each other, and then reversing them, the whole ground is ploughed; and, if the first furrows are shallow, the ridge has but a slight elevation in the centre. These furrows, when reversed, form the crown of the ridge, and direct the ploughmen who are to follow. The same operations are carried on until the whole field is marked out.

The direction and length of ridges are points which must evidently be regulated by the nature of the surface, and the size of the field. Short angular ridges, called *butts*, which are often necessary in a field of irregular boundaries, are always attended with a considerable loss of time, and ought to be avoided as much as possible.

In ploughing steep land, it is advisable to give the ridges an inclination towards the right hand at the top, by which, in going up the acclivity, the furrow falls more readily from the plough, and with less fatigue to the horses. Another advantage in forming ridges in a slanting direction on such land is, that the soil is not so likely to be washed down from the higher ground, as if the ridges were laid at right angles. Wherever circumstances will permit, however, the best direction is due north and south, by which the grain on both sides of the ridge enjoys nearly equal advantages from the influence of the sun.

In ploughing relatively to season, it is well known that clayey or tenacious soils should never be ploughed when wet; and that it is almost equally improper to let them become too dry; especially if a crop is to be sown without a second ploughing. The state in which such lands should be ploughed is what is commonly indicated by the phrase, "between the wet and the dry"—while the ground is slightly moist, mellow, and the least cohesive.

CHAPTER XXIV.

WEEDS—BIRDS.

Canada Thistle.—The subject of this article is so important, that we deem no apology necessary for printing at length the details of the successful result of a method adopted by the writer, Thomas Hillhouse, Esq., for destroying this pest of the farmer. The communication was originally published in the Genesee Farmer.

"The extermination of this pest of our plough fields, is an object of great importance to all farmers, who are unfortunate enough to have them on their lands; and it is therefore, in a measure, incumbent on them to communicate to each other whatever methods they have taken for that purpose, and particularly such as have had the desired effect.

"I have no expectation that this thistle is to be totally and entirely eradicated, and banished from the country, as it is a perennial plant, and is to be found on the road sides, in woods, and in all unoccupied lands, (at least in this vicinity.) All that can be done with such, if near at hand, is to cut them off and prevent their seeding. But being possessed of another manner of propagating themselves, more sure and certain, by their side or horizontal roots, which the cutting of the tops of the plant does not effect or check; they therefore must be permitted to remain, in such places, by a sort of compromise, that they are to be prevented from scattering their seeds on to our plough fields, from which I am confident they may be expelled, and after which, easily kept out; any further than this I shall not attempt doing, or advise others to do.

"Some enactments of the Legislature, as recommended in the Farmer, would undoubtedly be of use. Such as obliging the owners of land (at least such as is under improvement,) to cut them at the proper time—imposing a penalty for neglect—and making it the duty of overseers of highways to have this done on the margin of roads. It would likewise have the effect of calling the public attention to the thing, and spread the alarm.

"In articles of this sort, intended to guide the operations of others, unless one goes somewhat into detail, the object is in a

16

measure lost; for those (if any there should be,) who may be induced to adopt the method recommended, will have a wish to know all the particulars of the process before they commence. I shall therefore be compelled to make this of greater length than I supposed at first setting out would be necessary. What is here stated, however, is all from my own knowledge: nothing is given on hearsay.

"When I purchased the farm which I now occupy, about thirty years ago, excepting some meadow lands, near a river, and some other small pieces, there were little or no improvements on it; being thrown out to commons, and mostly covered with small sapling wood and bushes—or as my Dutch neighbours expressed it, "*it had run out to bush.*" In open spots in this *bush*, the Canada thistle was sprinkled pretty liberally; and after clearing and ploughing they began to spread to an alarming extent, and threatened to overrun the whole premises. This first led me (but not in time by many years) to adopt some method more effectual than cutting off the tops to stop their progress.

"It is well known to all farmers as well as botanists, that the roots of no tree or plant, whether annual, biennial, or perennial, can long survive, if prevented from vegetating, and coming up to the light of day. My theory was based on this principle. I commenced operations about eight years ago on some small patches in a field planted with corn, as soon as any thistles appeared after planting, cutting them off twice a week at first; and was very particular never to have it neglected. It would take but a few moments to go over a patch two or three rods square, with a hoe; at the same time being very careful to leave none: and to be sure of this I generally went over the ground, row by row, a second time. The deeper they are cut off with the corner of the hoe, the longer time of course it will require the new shoots to reach the surface again. I followed them up in this way, and about the middle of August they began to come up thin and scattering, and appeared of a sickly, yellowish hue. This was encouraging, and we continued the operation, (though I found it was not necessary to look to them quite as often as at first,) to about the first of October, or until no more appeared, and none have since shown themselves on these spots.

"By digging down to the main roots in August or September, they were found in a state of decay, being of a blackish colour. The result of this first attempt, is already given; but I will give something more of the details of the operation. That there should be no difficulty in finding the several patches when the corn had attained its full height, I placed high poles at each spot so that they could be seen over the tops of the corn, and kept a hoe on the ground to be ready at hand whenever I happened, in

walking over my premises, to take them in my way, and cut them off if any were to be seen. In this way, but little time was spent; in fact none worth noticing. And as early as the first of October, as before observed, they were completely conquered. I ascribe the early season at which these patches were subdued, to their being allowed no breathing spell, and no omission being made through the season of operation, of cutting them off as fast as they appeared.

"I have sometimes in lieu of, or rather for the want of a hoe, used a piece of hard wood, flattened to two or three inches wide at one end, and sharpened; or what is still better, a piece of iron or steel, like a chisel, fastened to the end of a stick or walking cane. It is proper to have some kind of a tool in hand, or at the spot, otherwise some might escape, when one was accidentally passing near them.

"Although the actual labour and time spent to destroy thistles in this way, is but trifling, at least in small patches; still it requires considerable patience and much diligence, that the thing may never on any account be neglected during the season of their growth; and I would caution all such as may have an inclination to try the experiment, that unless they are fully determined to persevere, and have full confidence that they can do it for at least four months, not to attempt it; because by any neglect during the season, the previous time spent is in part lost; as by allowing the plants a breathing spell in the sun and air, new life and vigour is communicated to the roots, which is the thing intended to be destroyed.

"To prevent the necessity of going over the ground as often as was required with the hoe, I last Spring had made some iron tools not unlike a small light crowbar, flattened at the lower end to about a hand's breadth and length, and steeled. With this tool, in soft mellow ground, the thistle may be taken up to the depth of six to twelve inches; but the process is much slower, and perhaps the time employed in killing them in this way, although the operation is not so often to be performed, is equal to doing it with a hoe, with which the ground is much quicker gone over.

"The horizontal root of this plant, so often mentioned as its principal instrument of propagation, will be found at various depths, according to soil. In lands under the plough, and in other rich mellow ground, they push themselves along, in every direction from the main patch, and at every few inches send up a branch to the surface. On carefully uncovering a space several feet square, I have found them in a manner connected and tied together with this root. Whenever they can be taken up below the horizontal root, they are mostly destroyed with once

going over, and with the iron tool before described this is frequently done; and where there may be a very small patch in a distant field, the inconvenience of looking to it as often as would be necessary with a hoe, might be avoided by taking this course. In wet rainy seasons, like the two last, I find they spread themselves much faster than in dry ones. The ground being soft, and the roots strong and vigorous, and meeting less resistance, they will push along a considerable distance in one Summer.

"About nine years since, I had made a string of half stone fence, with posts, and boards on top. The ground on which the wall was placed, was rich bottom, and was set there to withstand the Spring floods. It was made on the line of one of my neighbour's land, on which at a small distance was a large patch of Canada thistles. In a short time they pushed along and reached the wall, and have run along in and under it, more than thirty rods, or fifteen each way, in about seven years. Having heard that salt and strong brine would kill them, I procured, three years ago, a quantity taken from fish barrels, and taking off the top stones of the wall so as to come nearer the roots, the brine and salt was put on very bountifully. It had the effect of killing the tops of the thistles, and wilted them down; but the next Summer they came up through the wall as thrifty as before. I see no remedy in a case like this, but to remove the wall, otherwise they will travel to each end of it, and from this lodgement spread over the adjoining field. And I have no doubt, that if a strip of rich, mellow land, reaching a distance of twenty miles, could be had, unobstructed by rivers, swamps, &c., a low stone wall placed thereon, and a family of thistles set a going at one end, but that they would in course of time reach the other, and without the agency of any seed.

"On my mowing and pasture lands, such as are wet and never ploughed, there are some patches of the thistle, which have for twenty-five years past remained nearly stationary. They are always mowed off in July, before the seed is ripe, and if necessary a second time, to prevent their seeding. In this kind of hard sward land, they are small and puny, and comparatively give but little trouble and annoyance.

"Whenever we have succeeded in expelling the thistle from our tillage lands, (which is the extent of my expectations, in respect to my own, and all that I would at present advise others to attempt doing,) they may, I am confident, with little care and no expense, be easily kept off afterwards. The seeding thistle is very small, and as easily destroyed as a pigweed, should they happen to be observed. It requires several years for them to form any considerable patch—their greatest security is their not being noticed, until by their side or horizontal roots they have

run out in different directions. Small patches may be killed by a deep covering of any thing that will keep them under, and prevent them from shooting up to the surface. This I have done with pumace put on to some very small bunches near my cider mill. Salting cattle and sheep often on small pieces will have the like effect; but this must be done very often and through the season of growing. The salt itself does not have the effect of destroying the roots, beeause it cannot reach them, but the frequent licking of the spot by the cattle takes off the shoot as fast as they come above the ground, which is the same in its effects, as hoeing them off. All these methods, however, cannot be practised except on a very small scale.

"I know of no plant or bush, with which the Canada thistle so nearly compares in its habits and modes of propagation, as the common elder. This, like the thistle, has its seed, and its horizontal roots with which to form patches; and like it, also, in not being to be destroyed by cutting off the tops once, or even twice a year, but must be rooted out. The same treatment which kills the thistle would have the like effect on the elder; but this would be attended with too much trouble, for the small number usually on our farms,—the better way, therefore, is to dig and root them out at once. But I think it is as great an absurdity for a farmer to say, that he will not attempt to destroy the clumps of elder on his mowing land, because his neighbour lets them alone to seed, as to refuse to kill the thistle on his plough land for the like cause. Since, in either case, when they are once eradicated they are easily kept out, let his neighbours' practice be what it may.

"In my various experiments, I have tested this method of destroying the thistle sufficiently to convince myself at least that it is very practicable, and attended with but little expense, if pursued with due care and perseverance. If no failures had happened in my several and yearly attempts, another year would have completed the routine of my ploughing fields, but it will now take three—and as I am less than that from three score and ten, and have a wish to complete what I have undertaken, I must be careful to avoid the like errors in future. I close this long article with the hope that it may be of use, by inducing some of my brother farmers, who have a good stock of resolution and perseverance, and a plenty of Canada thistles on their land, to try the experiment, at first if they please, on a small scale. I shall be pleased to be informed of the results, and particularly of their success. In the interim, I would inform them that I have allotted and set off for the ensuing year, a pretty large job of the same sort. The ground on two fields being already once ploughed for corn, on which there are patches of this-

16*

tles in plenty, enough to cover three and a half or four acres, of which, provided my health is spared, I hope to be able to give a good account at the close of another year.

"I would add one more remark, that no grass or weeds of any kind, must be permitted to grow on the spots or patches during the season of the operation, as they conceal the thistle sprouts, which may consequently escape the hoe. I have usually, on spots where the thistles were thick and intermixed with weeds, hoed the ground well all over as often as it was necessary to destroy the weeds, and at the same time the thistle was taken off also."

A writer in the Cultivator says, "I am glad to see your correspondents alive to the subject of destroying the Canada thistle, as it is high time that something is done to arrest their progress, particularly in the western districts of our state. And seeing a communication in your last No. requesting practical knowledge on any subject that may interest the farming community, I felt willing to throw in my mite, though with diffidence, on this all-important subject. We last year had a strip extending quite through a field, where we intended to sow barley, which we did not sow; but as the thistles appeared turned them under with a plough pretty deep at first, and in the course of the Summer ploughed the piece seven times, and harrowed as many more, which has effectually destroyed them, there being now not one to be seen. After the three first ploughings they sprung up very soon; after that, they began to appear sickly, and of a yellowish cast, and after the fifth ploughing they appeared no more. This year we are managing thirty acres in the same way, and several of our neighbours, seeing the beneficial effects of the experiment, are now pursuing the same method. Planting the piece with corn the first year, if it be sod, I think preferable, as that subdues the sod, which otherwise would be much in the way of early cross ploughing.

"Some have contended that much ploughing hurts the land; but experience has confirmed me in the opinion that it is very beneficial to it: first, because it kills every thing foul in it, and secondly, by the act of pulverization, renders the soil light and loose, and by that means pervious to heat and water. We have wheat now growing on the piece, which is beginning to tumble down, and my greatest fear is, that it will be too large to fill well. There was no manure put on it, while the wheat adjoining is not equal to it, though heavily coated with stable manure.

"I perfectly agree with *A Subscriber*, in your last No. that keep down the top of any plant one Summer, and it will effectually destroy it. Such being the fact gained by experience, (the

best school extant,) I think a knowledge of it ought to be more generally diffused."

Birds.—It is a well known fact, that the alarming increase of worms and insects in making ravages upon our fruit trees and fruit, not only paralizes the efforts and disheartens the hopes of the cultivator, but threatens total destruction to many of the most delicious kind. So extensive are their ravages, that but few of our apricots and prunes ever ripen without premature decay from the worms generated by the beetles which surround our trees in the twilight of the evening in great numbers, when the fruit is quite young. And when the produce of our apple, pear, or peach trees is small, but few of these escape the same fate.

I attribute the rapid and alarming *increase* of these worms and insects, wholly to the diminution of those birds which fall a prey to our sportsmen, which are known to feed upon them, and for whose subsistence these insects were apparently created.

In addition to the important usefulness of these birds, their musical notes in the twilight of the morning are peculiarly delightful, awaking the cultivator to the sublime contemplation and enjoyment of all the infinite beauties of creation.

In vain will be all our toil and labour, in vain the united efforts of Horticultural Societies for increasing and perfecting the cultivation of the most delicious varieties of fruits, unless we can *increase*, or at least *cease* to diminish, these useful and melodious birds.

The following excellent remarks on the subject of destroying birds, originally appeared in the Boston Patriot:

We are of opinion, that the labours of the scientific ornithologist are of far more practical utility than the usual observer supposes; and that, even in the business of legislation, a regard to his researches might prevent many errors, which may much affect public welfare. Legislation on the subject of birds has been marked by some essential errors, which have led to real evil. By it woodcocks, snipes, larks, and robins, are protected at certain seasons of the year, whilst war to the knife is declared against crows, blackbirds, owls, blue jays, and hawks; these last are treated as a sort of pirates, subject to a suspension at the yard arm, with the least possible ceremony. It so happens, that the character of these very birds has been singularly mistaken; for while the ordinance of legislation has been thus systematically levelled at them, they, on a principle which man would do extremely well to imitate, have been returning good for evil; they have been diligently engaged in extirpating all sorts of vermin, while never were the vilest vermin half so ill treated by the hu-

man race. The crow, for example, who is generally regarded as a most suspicious character, has had great injustice done him.

In the Spring, when the ground is moist, he lives in a state of the most triumphant luxury on grubs; he eats the young corn, it is true, but it is a necessary of life to which he never resorts, except when his supply of animal food is shortened. After the corn is tolerably grown, he has nothing more to do with it; and in any stage he destroys at least five hundred pernicious grubs and insects, for every blade of corn which he pillages from man. In the southern States, he is regularly permitted to accompany the ploughman, and collect the grubs from the newly opened furrow; his life is thus secured by the safest of all tenures—that of the interest of man in permitting him to live.

There is scarcely a farm in England, without its rookery; the humid atmosphere multiplies every species of insects, and these birds reward man for his forbearance, by ridding him of legions of his foes. By a policy very similar to that which dictated the revocation of the edict of Nantes, they have occasionally been exposed to the mischievous propensities of unruly boys, who, as far as utility is concerned, are not to be compared to crows; but the error of this step soon became obvious, and they are now received with universal welcome.

The hawk enjoys a double reputation in the hen-roost: he sometimes destroys the chickens, but with man's consistency, does not like to see his infirmities copied by another; and by way of compensation demolishes the fox, which eats twenty chickens where he eats but one: so that it is hardly the part of wisdom to set a price upon his head, while the fox, a hardened knave, is not honoured with a penal statute.

How the owl came to be included in this black list, it is difficult to conjecture; he is a grave, reflecting bird, who has nothing to do with man, except to benefit him, by eating weazles, foxes, racoons, rats, and mice, a sin for which most house-keepers will readily forgive him. In some parts of Europe, he is kept in families, like a cat, whom he equals in patience and surpasses in alertness.

Another of these birds, the blackbird, is the avowed enemy of grubs, like the crow: in the middle States, the farmer too well knows the value of his company, to pluck them from the furrow; and while other less painstaking birds collect the vermin from the surface, his investigations are more profound, and he digs to the depth of several inches in order to discover them. When the insects are no longer to be found, he eats the corn, as well he may, but even then asks only a moderate compensation for his former services; five hundred blackbirds do less injury to the corn than a single squirrel.

The last upon the catalogue of persecuted birds, is the blue jay. Whoever watches him in the garden, will see him descend instantly from the trees, pouncing every time upon the grub, *his* enemy and *ours*.

These acts of legislation protect some birds at certain seasons of the year; among others, the robin, who lives on insects and worms, and has no taste for vegetable diet, and the lark, who is extremely useful in his way. The only wonder is, that it should have been thought expedient to allow them to be shot in any season. The quail, another of the privileged class, has no title to be named in company with the others; in the planting time, he makes more havoc than a regiment of crows, without atoning for his misdeeds by demolishing a single grub. Nor is the partridge a more scrupulous inspector of the rights of property; though as he lives in comparative retirement, he succeeds in preserving a name for honesty.

There are some of our most familiar birds, of which a word may be here said. Every body has seen the little goldfinch on the thistle by the wayside, and wondered perhaps that his taste led him to so thorny a luxury; but he is all this time engaged in devouring the seeds, which but for him would overrun the ground of every farmer. Even the bob-o'-link, a most conceited coxcomb, who steals with all imaginary grace, destroys millions of insects that annoy the farmer most. All the little birds, in fact, which are seen about the blossoms of the trees, are doing us the same service in their own way.

Perhaps there is no bird which is considered more decidedly wanting in principle than the woodpecker—and, certainly, so far as man is concerned, there is none more conscientious. So long as a dead tree can be found for a nest, he will not trouble himself to bore into a living one; whatever wounds he makes upon the living are considered by foreign gardeners as an advantage to the tree. The sound tree is not the object—he is in pursuit of insects and their larvæ. In South Carolina and Georgia, forests of a vast extent have been destroyed by an insect, which would seem as capable of lifting a tree as destroying it. The people were alarmed by the visitation, and sagaciously laid the mischief at the door of the woodpecker, until they had confounded the bailiff with the rogue.

The injury arising from the loss of a single crop is hardly to be estimated. The experience which is taught by our own misfortune, is very dearly bought; and if we think how we can derive it from others—if, for example, we can learn from the ornithologist the means of preventing such injury, as in many instances we may, the dictates of economy combine with those of taste, and warn us not to neglect the result of his researches.

CHAPTER XXV.

WOODLAND—FENCES—PONDS.

Woodland.—Few persons have any adequate idea of the importance of wood land to a country. Wood is not only useful for fuel, timber, tools, &c., but without it the continent of America would be as barren as the deserts of Africa. Trees protect cattle and other useful animals from the burning rays of the sun, prevent or moderate the effects of heat and drought on the soil, produce moisture and vital air by transpiration of the leaves, regulate and soften the temperature of the climate, and are indispensable, not only to the comfort and civilization, but to the existence of human beings. A world without a sun, or an earth without an atmosphere, would scarcely be more intolerable or uninhabitable, than a country without trees.

A farmer might almost as well be without a wife, as without a wood lot. It is well observed in Deane's New England Farmer, that "in clearing farms in a new country, due regard should be had to preserving a perpetual forest. Some have mistaken their interest so much, as not to leave a sufficient quantity of land uncleared; so that they are put to the disagreeable necessity, either of buying their wood, or else of going, perhaps, some miles after it. That part of a farm should be set apart for this purpose, which is least adapted by nature for tillage or grass. Land which is swampy, with a very thin soil over a sandy bottom: land that is rocky and mountainous, or which will but poorly bear a dry season, or even the most sandy or gravelly heights, or steep declivities which cannot be ploughed, may answer well for a forest. Forest trees having long roots, some of which penetrate deeply, may find sufficient nourishment, in places where corn and grass cannot be cultivated to advantage. So that it is very bad economy, to suffer any such place to be destitute of growing trees. For if they do not produce wood, they are in a manner useless. Or if they produce grass, trees will not hurt them for pasturage, but in some cases make it better.

"The quantity of ground that should be set apart for this use,

must vary according to the largeness of the farm it belongs to, and according to the demand for wood, the quality of the soil, and the nature of the climate. If the climate be hot, the forest may be smaller. Some intelligent farmers in this country, have thought they could make a lot of ten or a dozen acres answer the purpose of supporting one constant kitchen fire. But it certainly will not, unless the soil be uncommonly fruitful, and the trees be such as are of the quickest growth. If land be poor and dry, it will require twenty acres or more, to supply one single fire, and keep the stock of trees undiminished." It is, however, a very easy matter, by the use of stoves for cooking, and warming rooms, to effect these objects with one-third of the fuel generally used when Dr. Deane wrote.

In some cases, it may be found more *profitable to keep tolerably good land in wood, than in any other cultivation. This* will depend on the vicinity to some market town, or some place where wood can be sold at a good price.

To thicken a forest, or to prevent its becoming too thin, cattle should be kept out of it at all seasons. The seeds or cuttings of trees of rapid growth, should also be set and planted in every part which has became destitute of growing wood. If woodland be allowed to get so thin that the sun can get in and cause the ground to be covered with a sward of grass, this will prevent the further growth of young timber; and in this way the ground becomes eventually stripped of all its growth.

Loudon's Gardener's Magazine remarks in substance, that the shoots from the stools or stumps of forest trees may either become crooked branches of little use except for fuel, or beautiful and straight timber trees, according as the old trees may be cut over close by the surface, or one foot above it. The closer the stump is cut to the ground, the straighter the suckers or sprouts. This important fact ought to be familiar to every owner of a wood lot, and constantly kept in mind by the gardener in pruning fruit trees.

In applying the axe to a wood lot, which the owner would wish to perpetuate by a series of reproductions, the best method is to cut down every tree as far as you proceed. This will give the sprouts from the stumps, and other young trees, the advantages of a free circulation of the air, and a fair exposure to the sun. But if some of the large trees are left, the shoots which spring up from the stumps of the others will languish beneath their shade.

Fire wood.—We hardly know of any business in which reform is more needed than in the management of fire wood.

Wood that is cut by the cord, and designed to stand through the Summer, should not be left in the woods, nor under shade

of any kind. Raise the bottom tier of sticks a few inches from the ground, for without this precaution it will be much damaged, and decayed timber enough to serve for this purpose may be generally found in the woods. The sticks when corded ought to range east and west, so that the sun may shine in at both ends, the piles consequently extending north and south.

On account of its drying better, no stick should be split into less than four pieces, except it be very small, or except it be designed for back-logs; and to prevent the last from becoming doted, it ought to be placed on the top of the pile where it can receive sun and air enough to compensate for its greater size.

An honored friend of ours assures us that the quality and value of fire-wood is much affected by the time when it is first cut.—He recommends it to be done in Winter, being careful to have it finished before the sap begins to rise. We are disposed to adopt his opinion; and though it is not in our power to furnish any estimate of the comparative or relative value of two parcels of the same kind of wood, cut at different seasons of the year,—yet we have found a great difference, which we know not how to ascribe to any other cause.

We intend the foregoing remarks more especially for those who have large quantities of wood either for the market or to keep over year, and who may wish to preserve it in the best order; but we have also a few words for such as do business on a smaller scale.

We have heard old mechanics say, that "the month of March is the best month in the whole year for drying stuff" or timber; and we believe the remark has been founded on observation.—We would not assert that it would season more than in one month of severe drought in Summer; but such droughts are very rare in this district; and taking several years together we think the average would best accord with that old saying. We shall therefore unhesitatingly recommend to every house-keeper to have his wood ready split and piled up to take advantage of the drying weather of that month.

If the wood stands out, exposed, let it have all the benefit of air and sunshine by ranging it in single rows to the north and south. Where chips are plenty they may be heaped on the top of the wood, and rounded so as to shed the rain. We have found it by experience to be an excellent arrangement.—*Genesee Farmer.*

FENCES.—In the dividing of lands, by means of fences, regard should be had to a variety of circumstances, such as the size of the farms, and the nature of them, as well as to the uses to which they are to be converted; and the materials of which fences are

to be formed. There is not a more expensive, perplexing circumstance about a farm, than the fields being in a straggling, disjointed situation. The judicious division of a farm, will save much labour, especially in travelling from one part to another.—Crooked fences should be avoided, both on account of expense and appearance. Although large farms should have large fields, yet small ones need not have proportionally small fields, for the same field may be appropriated to different crops, and the expense of division fences saved. But whatever the dimensions adopted, attention should be paid to the convenience of water, the purposes of draining, and the bringing together lands of a similar quality, or such as can be cultivated and sown under the same circumstances.

All tillage lots, especially small ones, should be square, to save labour in ploughing. For, if a lot be long and narrow, cross ploughing will be either prevented, or the labour of it much increased. If possible, tillage lots should be near the barn, to save labour in carting manure. Mowing lots should be next to the tillage, if the soil permits, as these must be dunged, and their crops carted; the lots for pasturage should be next, and the wood lots the most distant from the house, that the view of the others may not be obstructed.

Poor fences are productive of incalculable mischief to the farmer. By these his crops are constantly liable to be destroyed, and his cattle become habitually unruly. One unruly creature will learn others to be so; and thus the farmer with his poor fences, finds his cattle, instead of being profitable, to become productive of unceasing losses, and, what follows of course, of unceasing vexation. When the farmer is conscious that he cannot even sleep in peace, on account of the danger of his cattle destroying the fruits of his labours, he cannot be said to enjoy that tranquillity which ought to be the reward of the sweat of his brow. Rather, therefore, let him make his fences what might be generally deemed more than sufficiently high and strong, than too low and weak. This, if it be an error, is erring on the safe side; on the side which secures the fruits of his labours, promotes his tranquillity and happiness, and tends to the maintenance of peace and harmony among neighbours.

Fences are made in various ways.

Log fences, are best when built of white pine, lasting perhaps 20 years. The next in durability are pitch pine, hemlock, ash, oak, and white maple. Bass wood, poplar, birch, beech, and rock maple soon rot. Logs that are peeled will last much longer.

Worm fences, are made with most ease, but require more timber than some others.

Post and rail fences, and board fences, are very good when the soil is dry. In a wet soil the posts will be moved by frosts.—The posts should be put two feet into the ground. Red cedar, locust, and chestnut, are best. Butter-nut, black-walnut, and oak, are pretty good, lasting about 15 years. Letting the bark remain on that part of the post put into the ground, is supposed to render it more durable. For the rails, cedar is best, lasting perhaps an age. If timber is scarce, and the ground is level and free from stones, post and rail fences, set in a bank made of the earth of two small ditches thrown up together, ought to be preferred. If the posts are too small to have holes made through them, the rails may be flatted at the ends, and fastened to the posts with spikes, or with wooden pins well secured.

In making post and rail fences, it has been recommended to set the posts with the top part in the ground, as it is said they will in that position, last three or four times as long, as when they are set with the but ends down. Let the rails also be placed with the heart side up.

Another expedient has been adopted by some of boring a hole in that part of the post which, when set, will be just at the surface of the earth, with such a slope as will carry it downwards an inch or two. Then fill the hole with salt, which will preserve the timber a long time.

Sometimes the lower end of posts are partially charred before they are set; or, where circumstances will permit, soaked in sea water, both of which are supposed to contribute to their durability.

Stone wall.—Building walls is not only the way to clear ground of a bad incumbrance, but it is the best and cheapest of all fences in the end, for if properly made it will last an age, with some trifling repairs. On a hard, sandy, or gravelly bottom, if built with good stones, a wall will stand very well without digging a trench. On a clay or miry soil, the foundation should be laid in a trench, nearly as low as the earth freezes. The best way is to dig a trench to the depth of about eighteen inches; into this throw all the small and bad shaped stones, until the trench is filled; then on the top of these build the wall, in a mason-like manner, to the height of about five feet, and throw the earth dug out of the trench up against the wall on each side.

A wall set on wet, spongy land, may be prevented from falling by raising the land on which the wall stands, more or less according as it is more or less wet; it is done mostly with the plough, by turning furrows towards each other, before the wall is made, or towards the wall after it is made, most commonly the latter; for in the latter case, the round or poorest stones may be put in the bottom, where they will be held in place by the earth turned

and raised against them. The water courses should be in the last furrows, on each side, and at three feet distance from the wall; the last furrow should be thrown on the first next the wall, and the loose dirt cleared out and thrown up with the spade.—A wall or half wall, protected in this manner, with suitable apertures at proper distances for the water to pass under it, seldom falls. This may be done as well on dry as on damp land. The depth of the ditch adds so much to the height of the wall. The ditch in all after ploughings should be preserved, and which may be easily done, by not turning furrows into it, but from it. The same may be done with board fences when made, for the like reason; as no water can afterwards stand about the fences, they remain firm and secure.

A cheap and permanent wall fence, may be made in the following manner. If the ground be inclined in a direction opposite to that of the fence, begin by turning three or four furrows downhill, with a side-hill plough; let them be thrown by the spade up the hill; plough three or four more on the same ground, and let them be thrown above the others.

Pick up your paving stones, if you have no better, or quarry about half as many as are requisite to make an ordinary 3 1-2 feet wall, and place them against the bank formed, until you have a fence four feet high, and from nine to fifteen inches thick, and what is better, one which will not fall down, and which has been tested to resist the frost, when all other methods of making stone walls have failed. The bank must incline one foot in the four, or four and a half, of height. This fence is made at less expense by one half of stone, and one third of ordinary wall in the price of laying.

If designed to stop sheep, it must be staked and sided, the stakes resting against the wall, with a rail running along the top, raised above the wall.

The same fence can be made on level ground.

Stake fence.—This is made for economy. In making it, the timber for stakes should be cut seven feet and a half long, and split to about the size of common rails. They should be set in the ground about eighteen inches, and each pair of sufficient distance, the one from the other, to admit a rail between them.

When the stakes are thus placed, a stone of sufficient size to raise the lower rail from the ground should be placed between them, on which to place the bottom rail, and proceed to fill up by placing the ends of the two adjoining length of rails alternately. After the fence is about four rails high, a hole should be bored through the two stakes with an inch and quarter auger, and a piece of good oak, or some other durable wood, drove through it, and the smaller end made fast by wedging. This pin should be

placed so high that as the stakes at the top of the ground will first fail, their length will be sufficient to allow them to be re-set; and the lower hole bored in them should be at such a distance from the ground as will prevent its being brought to the surface of the second setting.

There should be two or three pins put through the stakes, the upper one only calculated to support the two ends of the upper rails, which may be raised a little above the other, and thus a fence with six rails may be made the height of seven, when allowed to rest upon each other. Such fences require less labour for making than post and rail, by about the amount required to hole the post and sharpen the rails, is equally durable as post and rail, and not more liable to be blown down by high winds.

Board fence.—In making board fences, it has been suggested that setting the posts alternately on each side of the fence would add greatly to its strength. The Editor of the Genesee Farmer says:

"I have a fence in view made in this way some twenty years ago, standing in a situation exposed to high winds, yet as erect as when first built. A farmer of my acquaintance who has had much experience in this kind of fence, carried his partiality for it so far as to build a door yard picket fence in this manner; and for a plain picket fence it was the handsomest I ever saw. The posts were sawed six inches at bottom, two at top, and four inches wide. The upper rail was spiked on the posts, and the other two halved on. The pickets were two inches wide, one inch thick, and five feet in length, reaching to the ground. The bottom board was one foot wide, nailed on to the pickets, this giving a heavier finish than when the pickets are placed upon it.—The posts standing outside, instead of looking bad, were an ornament, adding an appearance of stability and firmness, always pleasing to a farmer.

"To illustrate more fully the advantage of setting posts both sides of the fence, I will describe a fence I have seen made where almost the only support it had consisted in thus placing the posts. The posts were made of plank 18 inches wide, 2 1-2 inches thick, 4 1-2 long, sawed in two diagonally, so as to make two posts 18 inches wide at bottom, and 1 inch at top—in shape a right angled triangle. These posts were placed on flat stones, and the boards nailed on in the usual manner, well battened and a good top board spiked on. As a precaution to its overturning, a strip of white oak plank three inches wide and three feet long is driven into the ground on the outward edge of each post, and nailed to it. A fence made in this manner, in situations not exposed to winds, may stand a long time—at least it will not rot—can easily be righted up, and a post set in the ground to support

it when necessary. It at least shows the advantages of having the posts placed on both sides of the fence, and having the bottom larger than the top. This kind of fence, if the boards are an inch thick, and well nailed, will withstand any horse or bull, and may perhaps be advantageous to those who cannot procure good timber for posts."

To add to the durability of the posts, instead of filling the holes up with the earth taken out in digging them, let them be filled up with leached ashes, topping off with five or six inches of unleached ashes above the surface of the ground. The reason for this is, that it has been observed that pieces of boards, hoops, and staves, buried under heaps of leached ashes, which have lain there many years, were quite as sound as when first buried.—Whence it is concluded, that this will tend greatly to preserve that part of the post which is under ground.

To preserve the boards, another writer gives the folowing account of a process for saturating them with lime; he says of the fence, that

"The boards were made of the common yellow pine, 3-4 inch thick;—previous to their being put in the fence, they were laid for some time in a trough of the proper length, containing thin whitewash; care being taken that the boards were entirely submersed, and kept separate, by thin strips being placed between them. They were suffered to lie in this position until they were pretty well saturated with the whitewash; then taken out, and others put in their place, to undergo the same operation.

"At the time we saw this fence, it had been standing seven years. One part of the string of fence was made in this way, and the other part made of materials of the same quality taken indiscriminately, but without the use of lime. That part which was taken made without lime, was at the time we speak of, undergoing repair; and at least one-half the boards of which it was composed, were so far decayed, as to be unworthy of being made use of in the new fence. On the contrary, on examining the boards in the other portion of the fence, which had been treated with lime as above mentioned, it was found that it did not need repairing, and no signs of decay were perceived. On being chipped off, the boards presented the appearance, all through their substance, that may be seen in the staves of an old lye tub; and, to all appearance, would last as much longer, without needing a renewal."

Live or hedge fences.—Live fences constitute much the larger proportion of all the fences in European countries, where fences of any kind are made for agricultural purposes. In England, where nearly all their lands in cultivation are inclosed, live fences abound, and are said to be preferred. In this country, we are

universally in the habit of inclosing and dividing all our farms into fields, with fences, and were induced to this practice probably from causes common, and perhaps unavoidable, in the settlement of all new countries, abounding in wood and in herbage for cattle. Whether this practice will continue, or be abandoned, must depend upon circumstances.

Earth or sod fences have lately been tried, and not found to answer the purpose. In districts or on farms abounding with stones, there will be no difficulty. But we have farms, and even extensive tracts of country, in which there are no stones suitable for making walls; and where fencing timber has become scarce in those places, live fences appear to be the last and only resort.

The length of time required for producing live fences, the expense of protecting fences in the first instance, and the expense of trimming after they have attained their growth, as well as the difficulty of procuring suitable plants for the purpose, we know are obstacles to be encountered. Still, as it is a subject which may some time or other become important, it should not be excluded from the book of the farmer.

In this view, we give the following, as the most successful experiment we have met with.

"*The Massachusetts Society for the Promotion of Agriculture*, in the view it was their duty to take of those objects to which public attention might be beneficially invited, have thought that in the progress of the culture and improvement of the country, live hedges would in many places become highly important and even necessary, where stone is not to be had, and timber, as must soon be the case, shall become more valuable for other uses. The beauty, permanency, and efficacy of this mode of inclosure, is with foreigners and many of our own countrymen becoming a subject of taste and admiration. It is not our intention to deny the efficacy or expediency, in most places, at present, of a good rail fence, or what is better a strong stone wall. But as our divisions of land multiply, these materials, in many places, will become more scarce and difficult to be had. As this shall occur, the introduction of live hedges will come into use here, as they prevail elsewhere. A gradual introduction of them must be useful, and add a verdure and beauty to the face of the country, as its cultivation increases. Under this impression the trustees of the Mass. Society were induced to offer a premium of $30 for the best hedge, not less than 100 rods, which shall be in the most thriving state in 1833.

"On this subject the committee on live hedges have a pleasure in presenting to the public the following communication of E. Hersy Derby, Esq. It will be seen that he has by well-tried experiments established the perfect adaptation of the buckthorn

(or rhamnus catharticus) to our climate, as well as its preference over several other plants.

"I have been for a great many years, says Mr. Derby, fully convinced of the superiority of live hedges, for efficacy and economy. I began by setting out my first hedge about thirty years since, of the English hawthorn; the result was far from satisfactory; the plant not being adapted to our climate, is injured by our Summer droughts; frequently experiences blight early in August, and by the first of September assumes a Wintry appearance. My next experiment was with the three-thorned acacia; to this hedge I devoted the most careful attention; but the result was equally unsuccessful. The plants run up without interlacing, and the thorns growing only upon the upper branches, the stems below were not thick enough to serve as a fence; it was beside too tender a plant to bear our severe Winters. I also tried the crab-apple with but little better success. About 1808, there was standing in the garden of the venerable Dr. Holyoke, of this town, which adjoined that of my brother, a large tree of buckthorn or rhamnus catharticus. In digging the latter, the gardener found several young plants which had grown from seed shed by this tree. They were given to me and set out in a nursery; finding they grew very rapidly, I was induced to set them out for a hedge some time in 1809, and in this attempt I was entirely successful The length of this hedge is about 20 rods; has been a good fence for over 20 years, and is at the present time in a fine healthy state, not a single plant having failed since it was first set out. It presents a mass of verdure from early Spring until late in the Autumn, and is completely impervious, affording entire protection to the land it incloses. It being my first experiment with the plant, I did not head it down so low when young, as I have since found it advisable to do; the consequence is that it is not so thick at bottom as any of my others set out since. Finding it so hardy a plant, and so well adapted for hedges in our climate, I have been induced to cultivate it very extensively, and have at different periods extended my hedges until they measure nearly 120 rods in length.

"The method I should recommend in setting a hedge, would be, to place the plants in a single row about 9 inches apart, either in the Spring or Fall of the year; if in the Fall, I should clip it the next Spring, within six inches of the ground, which will cause it to be quite thick from the bottom; any after pruning can be made to suit the pleasure of the cultivator. I have also tried plashing; it was recommended to me in 1818 or '19, by my gardener (an Englishman), and I allowed him to try it upon a young hedge of crab apple; but the hedge never flourished afterwards, and I at last pruned away the branches he had interwoven, and

lost four years' growth by the experiment. I have never found plashing necessary for the strength or beauty of the buckthorn hedge, the natural growth of the branches being sufficiently interlaced. Three years' careful management in the way I have described, is sufficient to form a perfect hedge, nearly as thick below as above. The tree produces a large quantity of seed, which vegetate very rapidly, so that it may be propagated either from seeds, or from cuttings."

PONDS.—Pastures that are destitute of water, should have artificial ponds made in them, for watering places. "Observe where rushes, weeds, flags, and other aquatic plants grow spontaneously: or where frogs are observed to lie squatted down close to the ground, in order to receive its moisture. Or observe where a vapour is frequently seen to rise from the same spot. Some say wherever little swarms of flies are seen constantly flying in the same place, and near the ground, in the morning after sunrise, there is water underneath." If a well is made in a sloping ground, and the declivity is enough to give it a horizontal vent, it will be worth the husbandman's while to dig such a passage, and by means of pipes or any other conveyance, to carry the water across the light soil, through which it might otherwise sink. The greatest quantity of water will be obtained in this manner, because there will be a continual stream. There is no difficulty in making a durable pond in a clayey soil. Let a large hollow basin be made in such earth, and it will preserve the water that falls in rain. But it is apt to be thick and dirty, if some pains be not taken to prevent it. The declivity by which the cattle enter, should be paved, and gravel should be spread on the bottom. Or it might be better if the whole were paved.

There are many large natural ponds which have outlets in one part, and are supplied by brooks and rivers in other parts; but a greater number of smaller ponds, which are perfectly stagnant, unless when they are agitated by winds. Such ponds as the latter, in hot seasons are apt to become putrid, and contaminate the air about them. For this reason, they should if possible, be drained. And when the water is not deep, and an outlet can be made without too much cost, they should be drained for the sake of reclaiming the soil. This will be of great value, as it commonly is found to be extremely rich, being made up of the finest particles of soil, wafted into them by winds, and of decayed vegetable substances, besides the fine mould washed into them by rains.

Many farms contain little sunken spots, which are most of the year covered with water, and produce some aquatic bushes and weeds. These are notorious harbours for frogs, and are there-

fore called frog ponds. They should be drained if it be practicable. It is commonly the case, however, that draining them in the common way, by making an outlet, would cost more than they would be worth when drained, because of the height of the land on every side. But in this case, if the banks be not clay, they may be drained in the following manner:

Take notice on which side land that is lower than the pond is nearest. On that side, in the bank near the pond, dig a kind of cellar, two or three feet deeper than the surface of the pond; do it in a dry season. If a hard stratum appear, dig through it; and leave digging when the bottom is loose gravel or sand. Then make an open or covered drain from the pond to the cellar. The water will be discharged from the pond, and soak into the earth through the bottom of the cellar, till a scurf is formed on the bottom, that will stop the water from soaking into the earth. This scurf should be broken from time to time, and taken away with a long handled hoe. Or the cellar may be filled up with the refuse stones, and I think it preferable to the other method.

If the pond should not become sufficiently dry, a small ditch should be drawn around it and discharge itself into the cellar. The land that is thus gained will be rich muck, much of which may be carted away for manure; and common earth or sand may replace it without detriment to the soil.

PART II.

THE ORCHARD, THE GARDEN, AND THE DAIRY.

CHAPTER I.

THE ORCHARD.

Soil and Situation.—Orchards are the parts of a farm appropriated to the growth of standard fruit trees. They may be reckoned among the permanent improvements of a farm, and should be kept in view in its first management and laying out.

It is generally admitted that fruit trees do well in a warm, friable, moist, and deep soil; that they succeed but indifferently on one that is cold and stiff, and that they altogether fail on one either very wet or very dry. The subsoil also has a very powerful influence on the health and prosperity of trees. If this be rock or what is called hard-pan (whatever be the surface), the trees and the fruits are much deteriorated. Nor will the remedy sometimes resorted to, of cutting off the tap root, and leaving the tree to subsist on those which are merely lateral, be sufficient.

Land half covered with rocks, and incapable of being cultivated with the plough, is in some respects admirably suited to the apple tree. For in such situations, they are not liable to suffer from drought; they receive nearly a double portion of moisture from the rains that fall, and a greater degree of heat by the reflected rays of the sun.

The most desirable aspect, is unquestionably a somewhat elevated and naturally sheltered declivity, open to the south and south-east. But orchards are now found "in every aspect, and on soil of every quality, and under every culture." Although the most approved site is that which is open to the south-east, and sheltered in other points, but particularly that opposite, yet much depends upon the character of the winds of a country. When the violence of a west wind is broken by an intervening rise of ground, a south-west aspect has been found equal to any.

Planting and Cultivation.—The first thing to be determined upon, in the planting of an orchard, is the proper distance of the trees; if a mere fruit plantation be the object, the distance may be small; if the cultivation of grain and grass be in view, the space between the trees must be wider; at thirty feet apart an acre will contain forty-eight trees; at thirty-five feet, thirty-

five trees; at forty feet, twenty-seven trees; and at fifty feet, about eighteen to the acre: these are the usual distances, which may be adopted according to the character and depth of the soil. As far as can conveniently be done, trees of the smallest growth may be planted on the lightest soil; and taking every circumstance into consideration, it will probably be found that forty feet is the most eligible distance for a farm orchard. It will admit sufficient sun and air, in our dry and warm climate; and until the trees shall be fully grown, will allow of a profitable application of the ground to the cultivation of grain and grasses.

Manner and time of planting.—Much trouble will be saved, and much accuracy in planting insured, by marking the sites of trees by stakes, previous to digging the holes. In shallow soils, the holes may be made to the depth of two spits of earth, scattering the lower spit at some distance, and supplying its place by an equal quantity of the neighbouring surface earth. The depth of the hole must depend on that of the subsoil.

An eligible mode for the lighter soils, which has been practised with much success, is to supply the place of the stratum of poor earth by one or two loads of meadow mud, ditch banks, or good surface soil, laid round each tree after planting, and ploughing the ground for a fallow crop the next Spring, when the mud has become completely pulverised by the frost. The size of the hole should be sufficient to admit a spade handle when laid horizontally in the bottom, affording ample room for the expansion of the roots in loose rich earth. Well digested compost is useful round newly planted trees, in stiff or cold soils. Both lime and fresh stable manure have been found prejudicial in the dry and hot weather of Summer. The latter substance is too frequently a cover for moles and field mice, which are extremely injurious in Winter to trees of even six or eight years old, in light soils. Every kind of manure on the surface, gradually mixing it with the soil by cultivation, has been found beneficial, and the best security against drought in Summer and vermin in Winter.

The proper season for planting will be found to depend on a variety of circumstances. In light soils, the Winter settles the earth round the roots, and best secures them against the drought the following season. It is a time of leisure to the farmer, and affords an early selection of trees from the nursery. In stiff or wet soils, Spring planting, other circumstances being equal, is to be preferred. But where proper care and attention is bestowed, success may follow in both cases. In whatever season an orchard may be planted, too much attention cannot be given to extend the roots in every direction; to cut off all wounded parts, and more especially not to plant too deep. This is the common error of inexperienced planters. As a general rule, trees should

be planted in the orchard with about three inches of earth over the upper tier of roots, which will make it about two inches deeper than it stood in the nursery. The trees after being partially covered, should be well shaken, to admit the finer particles of earth among the fibrous roots, and be well settled by treading the earth around it.

The tops of young trees should never be shortened, lest it produce a growth of suckers. They may be thinned if found too heavy. If the trees have been long out of ground, and the roots have become shrivelled at the time of planting, the labour of pouring a pailfull of water round each tree, will be amply repaid in the success it will insure in their growth.

Cultivation of the ground.—The looser the ground is kept for the first, and indeed for several succeeding years, the more certain and more vigorous will be the growth of the orchard. Every stage of cultivation is strongly marked in the luxuriance and colour of the foliage of contiguous plantations. Those orchards which have been two years under cultivation, exhibit a striking superiority over those which have been but one year under the plough; while these in their turn surpass the fields in clover or in grain, both in the quantity and size of the fruit. When clover is sown in young orchards, it will be well to dig the earth for about three feet, at the root of each tree. A man will dig round 100 trees in a day; the trifling loss of grass and labour will be fully remunerated by the improved vigour of the tree. When the ground can be spared from cropping, four or five furrows on each side of of a row will be found a most eligible mode of promoting the growth of a young orchard.

All fallow crops are most favourable to the growth of orchards, at every early stage of their cultivation. Indian corn, potatoes, and vines, are preferable to oats or barley; and these again are more favourable than Winter grain. Buckwheat is among the most beneficial crops for the promotion of the autumnal growth of trees. Clover, is by many farmers believed to be injurious to young trees. Its tendency to check the growth of trees, will be found to be in proportion to the air and moisture, which its greater or less vigorous growth may keep from the roots. Light and heat appear to be as necessary to the roots, as to the branches of trees. Clover, while it occupies the ground, must prevent cultivation, and may so far be found pernicious, but probably not in a greater degree, than any other luxuriant and deeply rooted grass, absorbing the moisture, and exhausting the strength of the soil, which covers the roots of small trees.

In the arrangement of an orchard, both convenience and beauty will result, from planting each kind of trees in distinct contiguous rows. Some cultivators pay particular attention to continue in the

orchard the aspect the tree maintained in the nursery. Mr. Coxe says, I have sometimes adopted the practice, without much confidence in its efficacy; nor can I think it probable that trees growing in close rows in the nursery, not much exposed, can by any habit so limited in its duration, be affected by any permanent contraction or rigidity of the bark or sap vessels, which are the only effects I have ever ascribed to the influence of aspect on the stems of young trees.

The prevalent winds of our climate are from north-west. In light soils their violence will sometimes give an inclination to newly planted trees to the south-east. This may easily be remedied, by setting up the trees while young, and when they have attained a large growth, it may be overcome in a great degree, by cutting off the leaning branches, and by freely pruning the leeward side of the tree. But this may be prevented in the beginning by fixing short poles or stakes, and tying the tree to them.

Moss is a plant produced by poverty and neglect; it is very prejudicial to trees, and should be carefully removed. This can be readily done by rubbing the trees in damp weather, with a bone or the back of a knife. A good cultivator will generally prevent the growth of moss. Whitewashing the stem not only cleanses the tree of moss, but destroys many kinds of lice injurious to fruit trees. It is followed by a cleanliness in the bark, after it has been dissolved by the rain, and promotes the health and vigour of the tree whenever applied.

The Nursery.—It has been said, and we think with much good sense, that "every farmer ought to raise his own trees," because, besides the risk, inconvenience, and expense, of bringing our plants from abroad, we have, in pursuing that mode of supply, to encounter the mistakes and the ill consequences which follow a want of analogy between the soil in which the plants were raised, and that to which they are to be transferred. The first step, therefore, towards obtaining a good orchard, is to create a good *nursery*. The situation most favorable for this, is a piece of level ground, defended from cold and violent winds, either by natural or artificial means, and which in composition is neither wet nor dry, and of only middling fertility. This condition of the soil is a circumstance of much importance, and ought to be rigorously observed; because the vessels of young trees, growing in rich soils, take a size proportioned to the quantity of sap they receive and circulate, and if their situation be changed for the worse, the quantity of the sap being necessarily diminished, the vessels become rigid and unhealthy, and unable to carry to the extremity of the branches the nourishment required by them. The ground (selected on these principles) must be

securely fenced, thoroughly ploughed and harrowed, freed from stones and the roots of perennial plants, and then thrown up into three or four feet ridges, on which you will sow and cover your apple and pear seed, and plant your cherry and peach stones.—It will now be useful to roll the beds, for the purpose of bringing the soil and the seeds every where into contact; after which they may be covered with clean straw for the Winter. In the Spring, your young apple and pear trees will show themselves, and after them your cherries and peaches. The treatment to all will be the same: they must be thinned to the distance of fifteen or twenty inches from each other, kept perfectly free from weeds, and if the weather be hot or dry, occasionally watered. They require only a repetition of this process, with the addition of a little careful pruning, till they have attained the height of seven or eight feet, when they are fit for grafting. It is generally known that by this operation we continue any given species of fruit; but a fact with which the public is less acquainted is, that if the graft be also grafted, the product is improved in quantity and quality; and it is to be presumed, will continue to improve, under every new and similar operation. Grafts to be well chosen, should be taken from the wood of the present year, from young and healthy races, and accommodated to the future use of the fruit. As we but speak of grafting in this place incidentally, it will not be expected that we should go into a dissertation upon that art, nor to elucidate the many divisions and subdivisions, which technical men have made of it. It is enough for us to say, that of all these different modes the *scion* and the *slit* is the simplest and the best. When your grafts have acquired some inches in length, it may be well to rub off all the buds which have pushed below them on the stem, and perhaps a few of those which have appeared above them, and if the grafts themselves put out any lateral shoots, spare them until the succeeding year, when you are called to re-graft such as have failed, and to furnish props to those which are feeble, or crooked, or ill-directed.

The year after planting, and in the month of February, when there is no circulation of sap, you will do well to begin to give the heads of your young trees that form which you wish them ultimately to take. The more circular you make them the better, always taking care to lop off those branches which do already or may hereafter, cross others having a proper direction. This proper direction will be generally horizontal, but with a slight curve; an opinion requiring perhaps a little explanation. All straight branches produce what are usually termed gourmands, or gluttons, giving little if any fruit themselves, and exceedingly exhausting the tree. Curved branches on the other hand, rarely produce gourmands; and when the season is favourable, give

much fruit. The observation of these facts, made long since, and probably growing out of the management of espaliers, first suggested the practice of bending straight branches by artificial means. The effect entirely justified the theory: these straight and barren branches, bent into nearly half a circle, changed their character with their shape, and became very productive. But there is a time for this, as for all other things, and unless the experiment be begun about the first of July, and continued to September, it will fail; because it is only within that period that fruit buds are formed.

As your trees advance in age they will require *pruning.*—Suckers must be removed, and dead and dying limbs taken off. For this purpose a hand-saw, a chisel, a mallet, and a gardener's knife, are the instruments to be used; all others must be proscribed, and particularly the axe, which in the hands of folly and ignorance, has been so mischievous to fruit trees. Wounds, if large, should always be covered from drying winds, from moisture, and even from air. In gummy trees, as the peach or the cherry, this precaution is indispensable, and the neglect of it a disgrace, since the best covering is that composed by cow dung and clay—materials costing nothing and always at hand.

On this subject one other rule may be given, and that is to open the ground about the roots of the trees in the Fall, to the influences of the air, rain, and frost. The last of these besides promoting vegetation, destroys many insects in the chrysalis state, which, if left undisturbed, would in the Spring be very injurious. Another part of the same rule is to cover with straw in the Spring the ground you make bare in the Fall; the object of which is to prevent evaporation by interrupting the rays of the sun, and thus securing to the roots the moisture necessary to their welfare.

Grafting and Inoculating.—Grafting is a mode of propagating varieties of fruit of esteemed quality. Grafts may be cut at any time after the fall of the leaf in Autumn, and before the buds begin to swell in the Spring. They should be of the preceding year's growth, and are best from bearing trees and exterior limbs. They may be preserved by imbedding their larger ends in clay, a potato, or in moist earth, in a cellar in Winter, or in the open ground, partially or wholly covered, in the Spring.—Grafts are frequently sent across the Atlantic. The great care should be, that they are not kept too warm or too moist, so that the buds swell before they are wanted for use. The rationale of grafting will suggest the time and the manner in which it should be done. The scion and graft are to be so adjusted that the sap wood of the stock, by which the sap ascends from the roots, comes in contact with the sap wood of the scion; and a like ad-

justment must be observed between the inner bark of both through which the sap descends from the graft to the stock, after it has been elaborated in the leaves. Without the first precaution, the sap will not reach the graft, which will consequently shrivel and die. Without the last, the graft cannot knit or unite to the stock; for it is the descending sap which forms the new wood, and which indeed causes the graft to send its roots down into the earth, upon the outside of the wood, but under the bark of the stock. The union can only take place after the sap has begun to circulate in the stock, which is when the buds are *bursting*. The clay or composition is applied to exclude the drying influence of the air and sun, and also rain, from the wound, until a complete union has taken place. The graft does not become injured by being somewhat shrivelled before it is inserted; but if it appears too much so, it may be buried a few hours in moist earth before used. The compositions used as substitutes for clay are many. A good one is one part tallow, two parts beeswax, and four parts rosin, melted and incorporated like shoemaker's wax. If the weather is cold this will require to be softened by immersing it a time in warm water. A thin layer of this covering the end of the stock and the slit, will suffice. With the addition of a little more tallow, the composition may be spread upon linen or cotton cloth, when warm, and the cloth cut to the required size for a graft, and applied with less trouble in the form of a prepared plaster. The different processes of grafting are so generally known that we need not detail them; our object being only to throw out such suggestions as may tend to render the success of operation more certain.

The following is the account of Mr. Robinson, of Portsmouth, (N. H.) of his method of performing the operation.

"Persons intending to graft or inoculate to good advantage, should in August procure their scions containing their buds and grafts. It is well to have for their better preservation, a portion of the larger limbs connected with them. If taken off immediately, they must be thrown, when bundled up and labelled, under the north side of your thick yard or garden fence, where they will be secure, if exposed to the influence of the atmosphere; having an eye in case of too warm and dry weather, they are not too much exposed. If so, just enter their but ends under the surface of the earth. This method is better than covering them up bodily, or keeping them in a cellar.

"Experience has taught me that there is a great advantage in procuring cuttings in this way, over the practice of neglecting till too late. I shall now attempt to show the best method to manage a nursery, as to securing good fruit in the most economical and speedy manner. To do this, grafting and inoculating is my

text. The nursery is supposed to have been judiciously managed, and of one year's growth from the seed. Of course the plants are from one to two feet high, and as large as a Dutch quill; some much larger. All of this size never will be more fit to bud. There should be no delay. These little young trees have their peculiarly smooth and pliable bark; they are very thrifty, and consequently, may be budded somewhat later than others of a different character. A nursery in this stage may be most advantageously budded. If the operation be skilful, they will take; and if otherwise, they receive no perceptible injury.—The advantages of early budding are numerous and great.—First, the job contemplated is over: you cannot have any uneasiness about it, from any delays. Your trees are in a much better state for coming to perfection; they will thrive much better notwithstanding they are cut off from two to four inches from the ground during the season; they will far outgrow the others in size and height, they also grow more erect and free from craggy twigs, a great saving in pruning. The improvement in their appearance is admirable. Picture to yourself trees from the nurseries such as I have received, and at full prices, with old stocks, half closed over, and budded two to three feet from the ground. The contrast is great.

"The disadvantage from suffering nurseries to remain till a number of years old, before budded, is obvious. The wound necessary for the bud, in thick and old bark, and especially if the bud does take, is of some injury. The cutting off the large old stock, leaving the bud alone while the stock is closed over—meantime the quantity of roots without a top in proportion—are great checks, and of much injury to the growth of the plant: and must ultimately affect the growth and health of the tree.

"I make these remarks from the authority of my own experience in inoculating a nursery in its different stages as above described.

"I shall now attempt to describe my process in budding. I was instructed to strike a horizontal cut through the bark, with a sharp knife, at a suitable place, on the north side of the stock; striking from this a perpendicular cut about an inch long, opening the bark with a knife or some instrument for the purpose; then taking a bud from the scion, having a care to take off a small portion of wood with the bud—then carefully taking away the wood, leaving the stem or eye of the bud whole and smooth—then thrusting in the bud with a due proportion of bark, three-fourths of an inch long, and half as wide. The bark of the but to be thrust in free from the bark of the stock, above—then closing over the bark of the bud with that of the stock, binding it carefully, with elm or bass rind or with coarse woollen yarn—

This process has not yet proved perfect; it has with me often failed. I have sought for a more perfect and sure process.—Accordingly, I have varied, as my judgment has led me, for a better method. I have found that instead of striking a horizontal, it is best to cut quite a sloping stroke, splitting down from this slope perpendicularly so low as to admit the bud, taking off in an oval shape, in the same careful manner as above described; having a care to preserve a little wood at the eye of the bud as I had in taking it away in the former process. The bud then is to be thrust under the raised bark, down so low as to admit the bark of the stock to come in its former place, above the bud, for half an inch, where it immediately receives its usual nourishment; being bound up with coarse woollen yarn, which I prefer to anything else. In winding on the yarn, I am careful to draw it gently over the wound, omitting to cover the bud till the last, over which I then draw the yarn very softly. In this process, every part works so natural, and so smooth, that if unbound the next day it would be difficult to distinguish the bud from a natural one; and indeed, the bud as well as the bark of the stock seems not in the least affected. In this mode of inoculating, there is no such thing as not taking. On the other hand, the bark being cut square across, and the bud not being sufficiently thrust down, the bark of the stock coming to bear on the outer bark of the bud, at the top of the slit, there is nothing to support it; but it dries and shrinks from its primitive place, admits air, and if the wood is taken out of the bud, it all fails together, especially if the eye of the bud is a little rubbed: at any rate, live or die, a dangerous wound is inflicted.

"The mode that I would recommend, is a safe and fast way of budding; it all works natural; a lad having his hand in, will put in from two to four hundred per day. I now proceed to give an account of inoculating in the Spring of the year. This was an experiment, with me, altogether. In the season of grafting, I choose a few trees that were of common size for grafting; some had two good equal branches, one of which I grafted, the other I inoculated at the same time. I carefully cut out the bark of the branch where I choose to place a bud, cutting downward, turning my knife in and out in such a manner as to take off the bark in the form usually given in taking off the bud; taking at the same time so much of the wood, as to compare with the bud from the scion; and, if the first cut failed, I carefully mended my hand, until it well suited. Thus the bark being all well done, the bud was laid in, inside comparing with inside; of course a space was left on the edge of the bark of the stock not covered from its extra thickness on the old stock. The buds thus being left somewhat sunk in the stock, were then secured in the usual way of budding."

TRANSPLANTING.—Success in transplanting trees depends much on the treatment they receive in that operation. On removing the trees from the nursery, care should be taken to prevent the roots from lying previously to planting them, otherwise they may receive considerable injury; and when they are to be transported to a distance, particular care should be taken to preserve them from drying winds before packing. Immediately on their receipt the bundles should be unpacked, the roots well watered and "laid in" until the ground in which they are to be planted be ready to receive them. By laying in, is to be understood the making of a trench sufficiently large to admit the roots, into which they are placed; the earth having been previously made fine is then filled in around them, and a gentle watering given, in which situation they may remain with safety, until planted.

The holes in which it is intended to plant them, should for an ordinary sized nursery tree, be from 2 1-2 to 3 feet in diameter, and about the same depth; the earth from the bottom should be thrown aside, and the place filled up with good compost or black mould (no fresh stable manure should be used in the compost). The tree should be planted one or two inches deeper than it stood in the nursery, the roots and fibres being spread out horizontally, and during the process of filling in the earth, the tree should be shaken several times so as to admit the soil between the roots, and also to fill up any cavities that might otherwise remain. The earth should then be trodden down and gently watered; in a short time it will have settled, and any hollows that may have formed, should be filled up—finishing by forming a basin around the trench to receive the rain or watering which may be necessary to give it, if the ensuing season should prove dry; to prevent the winds from loosening the earth round the roots, the tree should be secured to a stake by bands of straw.

The proper season for transplanting trees in this latitude, is from the middle of October to the first or middle of May. Trees transplanted in Autumn should have the roots a little protected during the first and most trying Winter. This protection may consist of a few inches of litter from the stable, placed among their trunks and over their roots. Moss from the meadows or evergreen boughs are, however, preferable for delicate plants, as these substances being almost incorruptible, never injure what they were designed to protect.

"We have observed," says the Genesee Farmer, "in regard to transplanting fruit trees, that we have rarely lost one that stood in cultivated ground, where the hoe was introduced several times in the course of the Summer; but on the contrary, where the trees were set in grassy land, or where the cultivation was neglected, our losses have been considerable. We therefore ad-

vise in order to insure the safety of such as have been planted out, either in the last Autumn or this Spring, to have the ground well hoed round them once a month; and if it be done every fortnight, it will be still better. The labour will not differ very materially from hoeing a hill of corn. It is worthy of notice, however, that the oftener it is done the easier it is to do—because the soil will be kept loose and mellow.

"To water trees in that condition may sometimes be useful; but we are not free to recommend it very highly. A loamy soil that is much watered soon becomes hard; the surface is glazed, rendered in a great measure impermeable to the air, and consequently is no longer capable of affording in dry weather the necessary nourishment to the plant. The sources of its fertility are obstructed. This may be better understood to some of our readers, when we state on the authority of Sir Humphrey Davy, that a soil in the greatest degree absorbent, exposed to the atmosphere till it becomes dry to the touch, still contains moisture equal to one-eighth part of its whole weight. This is discoverable by subjecting it to a heat indicated by 300 degrees of Fahrenheit's thermometer. Now all water not chemically combined, but only *adhering* to parts of the soil, is in constant use in vegetation: and the one-eighth part referred to is of this kind. If we estimate common fertile soils however, as containing only one-twelfth part, then in 400 pounds of soil, even when it is dry to the touch, we shall have 33 pounds of water in store for the use of vegetation; and it is particularly worthy of notice, that such soils when deprived of a portion of this by plants, procure a fresh supply *by constantly absorbing water from the atmosphere,* where it exists in the state of vapour. In effect, a good soil is a perpetual fountain, even in dry weather.

"From these statements it must be evident, that unless the ground is frequently cultivated and kept mellow, so that between its particles the air can pass in, the latter cannot impart the moisture which it holds in solution; but when the soil is freshly broken, minutely divided, and prevented from conglomerating, these invisible springs are preserved in order, and plants that drink from them will long resist the drought. Let the hoe then, be freely and frequently used."

PRUNING.—The principal objects of pruning, are to procure a good bole or trunk for timber; to form a head for the protection of fruit; and to subserve the purpose of ornament.

To effect these objects with the least trouble and greatest advantage, upon all non-resinous trees, the following rules are recommended:

1. Begin to prune the tree when it is young.

2. Cut close and smooth to the bole or limb.

3. Cut, when small, the branches which are likely to interfere, or become useless, and which if suffered to remain, will require to be removed at a more advanced period of growth.

4. Do not trim to excess. Let the branches occupy *at least* a third of the entire height of a tree.

5. Do not prune when the tree bleeds. Where the preceding suggestions are observed, we may add—

6. Prune in the Summer.

I proceed to offer my reasons for the rules here recommended, and

First, The food required to nourish the lateral useless branches, will go to increase the diameter and height of the plant, or swell the fruit, if these are judiciously removed. But a main consideration is, that the excision of small branches causes only small wounds, and small wounds speedily heal. The observation of this rule, therefore, facilitates growth, promotes health, and ultimately saves labour.

Secondly, This rule needs very little argument to enforce its propriety, as every observer must have frequently seen and lamented the ruinous effects of an opposite practice. The snags either send out useless spray; or deprived of the feeble aid of these, they die and rot, and carry disease into the bole, and are thus often the cause of the premature loss of the tree. If cut close, the enlargement of the living wood soon covers the wound. In large branches where the saw must be used, the healing process is greatly facilitated, by paring the cut, particularly the exterior edges, with the pruning knife, and it is a good precaution, before you use the saw, to notch under the intended cut, to prevent tearing the bark when the limb falls. In extirpating sprouts from the roots, (and neither they nor those growing from the bole should be suffered long to remain,) the like precaution of cutting close should be observed; for which purpose it is necessary first to remove the earth from about the collar, with the spade or other instrument.

Thirdly, The reasons for pruning a tree while young, apply here: it is easier to cut small than large limbs, and the wounds of the former soon heal. But the question presents, what limbs are to be cut? Generally all that are likely to cross each other, all feeble spray, the strongest on the bole, and the weakest in the top; for while the trees are in nursery, I think it serviceable to leave a few scattering laterals upon the bole, and it is beneficial, at all ages, to thin most kinds in the top. Yet the answer to the inquiry will depend principally upon the species of tree, and the design of the planter. If his object be timber, the leading shoot should be feathered up in a spiral form, and all other shoots likely

to interfere with its growth be cut away. If the object be fruit, beauty and utility are to be consulted, and these seldom are incompatible in the eyes of a fruit grower, for with him productiveness constitutes beauty. If ornament be the main consideration, no special directions can be given, as the species employed, the location, and the taste and fancy of the planter, will have a controlling influence. The rule for timber trees will not apply to either those destined for fruit or ornament.

In orchard and garden fruit, generally, the endeavour should be to obtain a low and spreading top. When a clean bole is obtained to a sufficient height, say, in the orchard, of seven or eight feet, and in the garden, according to fancy, the leading shoot should be cut in, and three or four more branches left to form the head; which, when the habit of the tree will permit it, should be pruned so as to give it a besom form, or that of a broom divested of its centre. Several advantages arise from this and a more extended form. It admits the air more freely, to mature the fruit and wood; it renders the trees less liable to be blown down; it facilitates the gathering of the fruit, and the pruning of the tree. But its principal advantage consists in its tendency to increase oviparous or fruit buds, and consequently to augment the fruit. A great growth of wood seems to be incompatible with a great crop of fruit, and vice versa. A cow that gives much milk seldom takes on much flesh during the milking season. If the secreted food is converted into milk and fruit, there can be but little reasonable hope of its adding to the flesh of the animal, or the wood of the vegetable. Erect branches produce most wood buds. Straight limbs produce less fruit than those that are curved or crooked. Whatever retards or diminishes the flow of elaborated sap, in a healthy tree, is favourable to the production of fruit. Hence wall trees, whose limbs are trained in the form of a fan, or in a horizontal direction, bear better fruit than those that grow upright as standards. Hence young trees are more apt to show blossoms the first and second year after transplanting, than in the two subsequent years. Pomologists have endeavoured to render this law in vegetation subservient to their interests, by adopting artificial means for producing the production of fruit buds. These means consist in ring-barking, transplanting, cutting the roots, training, pruning, &c. The pears in the Caledonian horticultural garden are trained *en quenouille*, that is, the lateral branches are cut in to a short distance of the main stem, and kept so, and the fruit is produced on the spurs growing from these short branches. In the horticultural garden of London, the limbs of the pear are tied down in a drooping position, resembling somewhat in appearance the weeping willow. The vines cultivated at Thomery,

celebrated for their superior fruit, are planted eighteen inches apart, trained in the form of a T, the top horizontally, and restricted in their growth to four feet from the main stem. In this way a treillance of eight feet long, and eight feet high, is sufficient for five vines, which produce upon an average 320 bunches of fruit. These modes of training have a common object, that of restricting the growth of wood, and producing an increase of fruit. Those who wish to examine the modes of training here spoken of, in detail, are referred to Loudon's Gardener's Magazine.

Fourthly, Leaves are as necessary in the economy of vegetation as roots. The sap must be elaborated in these before it can be transmuted into wood, bark, or fruit. A tree cannot thrive, therefore, when these organs are deficient or diseased.—If sufficient leaves or branches to produce them, are not left to concoct or digest the sap which is propelled from the roots, the tree, to use a modern term but a just comparison, becomes *dyspeptic*; the vegetable blood is vitiated, the wood loses its texture, and a stunted growth or premature death generally ensues.—Hence great precautions should be used against excessive pruning.

Fifthly, To prune when the tree bleeds tends to debilitate, by wasting what is designed as food for the tree. I have known it fatal to the vine. What is called bleeding is the flowing of the sap from wounds, before it has been converted into aliment.—This sap flows most freely while the buds are swelling, and until the leaves are fully capable of discharging their office, as is strongly instanced in the maple, birch, &c. Our orchards are generally pruned in March, which is probably the most unfavourable month in the year for this operation.

Sixthly, The advantages of Summer pruning are that the tree being then in vigorous growth, the wounds heal speedily; and the sap being concocted and thick, does not flow from the wounds, and thereby impair the health of the plant. Summer pruning should not be performed, however, before July, when the new growth has considerably advanced. It may be well to add, as this suggestion may seem unsound, that Summer pruning is recommended by the best authorities. "As a general rule," says Pontney, "Summer is preferable to Winter pruning:" and Sang suspends pruning, "from the beginning of February, to the middle of July, but carries it on during every other month of the year."

In regard to evergreens, which with us are confined principally to resinous trees, it is the general practice of nurserymen, and I think it a judicious one, not to prune them until they have acquired some years' growth, and then but sparingly, and at long intervals, displacing two or three tiers of the lower branches,

every two or three years. Monteith says, "never cut off a branch until it has begun to rot, as the bleeding of a live branch will go far to kill the tree."

The implements employed in pruning, and the manner of using them, are matters of moment. If the operation is commenced when the tree is young, and judiciously followed up, a good knife, a small saw, and a chisel fixed on a six foot handle, to trim the tops and extremities of the branches, are all the tools that are required. A large saw will be occasionally wanted; but an axe or hatchet should never be employed, as they fracture the wood, bruise and tear the bark, and disfigure the tree.

[The above excellent remarks on Pruning, are by Judge Buel, published in the *Genesee Farmer.*]

Dwarf Fruit Trees.—In some places, especially in France, a method prevails of cultivating dwarf fruit trees. These are said by English and French writers, to have many advantages. The trees are not as much exposed to high winds, they produce better fruit, bear earlier, and more abundantly.

Dwarf trees are produced by inoculating on stocks of comparatively slow growth. Thus by inoculating the apple on the Paradise or *Doucin* stock, the peach on a slow growing plumb stock, and the pear on the quince stock, &c. This is practised here, more particularly, in gardens where the trees are set along the borders alternating with gooseberries or currant bushes.

The pruning and management of dwarf apple and pear trees, are well described in the following remarks.

The first subjects of the following remarks, from their appearance, were planted six or seven years previously to the commencement of any pruning being given them. In consequence they required to be very much thinned out, so as to get the branches clear of each other. For thinning I always bore in mind to cut the old wood off close to the stem or branch it was attached to; this prevented young wood springing afterwards.—When the trees were thinned of the old shoots, as above stated, the young side shoots were what is generally termed spurred in; that is, they were so shortened, that only two or three buds were left on them, and the leading top shoots were shortened to half their length.

The following and every succeeding year, the trees were treated in the same manner, as respects the young wood, till they had acquired the desired height, when the leading shoots were shortened, as the side shoots or spurs had been previously. When the leading shoots show an indication to grow very luxuriantly, which is apt to be the case under this treatment, they should be prevented doing so, by cutting off part of the old wood, along

with the young shoots immediately above a flower bud. This will prevent the shoot so cut from increasing in length. The spurs must be treated in a similar manner, by cutting off a small portion of the old wood along with the young, when they are getting too long. I have never found the above treatment prevent the fruit swelling, or in any way detrimental to it; but on the contrary, it was always improved.

Young trees are to be treated in the following manner;—If there are more than three shoots on the plant, reduce them to that number, and shorten each to three, four, and six eyes, according to their strength. The following season reduce the number of leading shoots to six, and shorten them to three-fourths of their length, and spur in the remaining shoots. The tree should be managed in every respect in this manner until it has attained the required size, which of course depends on the convenience or fancy of the owner, or conductor of the garden.

I make a point of letting the trees take their natural form of growth as far as the system described will permit; for I consider it of little consequence what shape is given to the tree, provided my end is attained; that is, to make every branch as it were a long spur, with bearing buds from the base to the extremity.

Two or three years' trial of this method only, might possibly deter many from a continuance of it, in consequence of the quantity of young wood which will be produced yearly at first, and from the apparent difficulty of getting rid of the superfluity. But the inconvenience will be ultimately surmounted if the foregoing instructions are attended to, and the continuance will be the possession of both healthy and fruitful trees. To attempt to bring very old trees into this method of management would be attended with difficulty, unless they were cut down short, and allowed to make new heads, which I should recommend where their produce can be spared for a time. In a few years fine healthy heads would be formed, which will yield fruit superior to any that could be expected from them, if left in their rude state. But if the trees cannot be spared to be headed down, they may be very much improved by thinning out the spray, and cutting out a few old branches, which will cause them to throw out young shoots, and these, in a short time, will become bearing wood. The remainder of the old branches may then be thinned out with effect. Even if this process is only performed once in two or three years, and the stems and branches well cleared of moss and dead bark, it will be of great service to the trees, and be a means of keeping them free from insects, and give them a neat and clean appearance.

Diseases of Fruit Trees.—Fruit trees, like other produc-

tions of the vegetable kingdom, have their enemies and their diseases. All excesses of heat or cold, wetness or dryness, are unfriendly to them; sometimes wholly destroying their fertility for the season; at others seriously injuring it, and occasionally, though rarely, disorganizing the trees themselves.

Many insects also prey upon them, attacking their leaves, blossoms, fruit, bark, or roots.

But after all, may not our own negligence be considered as the most fruitful source of many others of a similar kind? We often find their bark covered and coloured with parasites, in the form of moss, lichens, and smut, which a small degree of labour and a little whitewash would entirely and promptly remove. We often see the ravages made on their leaves and fruit buds, by caterpillars of different names and appearances, when if we visited them at day-break, all would be found at home and asleep, and entirely within our reach. And lastly, we often see wounds inflicted on stems and branches (under the name of pruning,) left open to the alternate action of air and frost, and sunshine, and thus occasion fatal consequences, when a cheap and simple covering (a mixture of clay and cow dung) would prevent the difficulty.

There cannot be a doubt that many of the evils above referred to, might be remedied by timely attention. Trees may be kept free from insects by washing them with soap suds before the insects have left those places where they have passed the Winter, and before the eggs which were deposited under the loose bark, and beneath limbs, &c. are hatched. By early washing trees, and vines, with strong soap suds, or with lime water, not only are innumerable eggs and insects destroyed, but the young plants and seeds of many varieties of mosses which infest or injure trees and vines, are destroyed also. Trees that are annually washed, have a more healthy appearance than those that are not, when growing side by side.

The application of lime has been known to restore old and apparently worn out trees, to renewed health. A gentleman in Essex, England, having in his orchard many old supposed worn out apple trees, which produced fruit scarcely larger than a walnut, last Winter took fresh made lime from the kiln, slacked it in water, and (without allowing time for its caustic quality to be injured by imbibing fixed air) well dressed the trees, applying the lime with a brush. The result was, that the insects and moss were completely destroyed, the outer rind fell off, and a new, smooth, clear one formed; and the trees, although some twenty years old, have now a most healthy appearance. The same treatment may be extended to other fruit-bearing trees, and probably with similar beneficial results.

Mr. Wheeler of Framingham, (Mass.) recommends to wash trees with a solution of potash. He says,

"Dissolve 2 pounds of potash of the first quality, in 7 quarts of water, for the bodies of the trees. If the limbs are covered with moss or lice, I take a painter's brush, and apply the solution to the moss, &c., with care not to touch the leaves or buds. It may be done at any time of the year when we are most at leisure. Once in two or four years is generally sufficient. I have no general rule, however, but wash them as often as they appear to need it—which is always when the bark is not smooth.

"No person need be afraid of this application's injuring fruit trees; but it may be applied with the utmost confidence. I have used it for nearly twenty years with great effect. I have recommended it to a great many gentlemen, but only a few have used it. Those who have tried it, are much pleased with its operation. The reason that it has not been more generally used is, that it has been fashionable to daub the trees with lime, clay, manure, and other compositions, which take two or three years to wash off, before the trees will look natural. When this solution of potash is applied, it has the desired effect immediately. It kills moss and lice at once; and the first rain that comes washes the bark perfectly smooth, and give it a fair, natural, healthy colour."

Caterpillars may be easily destroyed, if taken in time, and at the proper time. Early in the morning, and in wet weather, they may be found concentrated in a small compass, under their web. If within reach, the whole colony may be crushed in a moment with the hand. To reach the more elevated webs, wind the end of a pole with rags, and with this destroy them. Or, what is better, affix a Pickering brush to the end of the pole, and with this destroy them. This brush is round and conical, somewhat resembling a bottle brush. A man or boy will clear an orchard of this pest before breakfast; and the operation may be repeated, if necessary, without expense, or much loss of time. Or, in place of a brush, put a sponge or swab made of rags, on the end of a pole, saturate it with lye made from common wood ashes, or soap suds may be used instead of lye; with this preparation give their nests a thorough washing early in the morning before these mischievous animals have gone abroad for their food. This will instantly prove fatal to them. Be careful to break the web of the nest, because they are so constructed as to shed the rain and dews, the animal will thus escape. Not one of them can live a minute after being wet with this liquid.

Many methods are prescribed to protect the different kinds of fruit trees from injury by insects, worms, &c., but these will be spoken of under the head of the trees themselves.

Orchards are generally composed of Apple, Pear, Peach, and Cherry trees; though to these may be added some others.

THE APPLE TREE.—"Of the many fruit trees in cultivation," says the author of the Treatise on Agriculture (Mem. Board of Agr. N. Y.) "this may be deemed the most important; not only from the great abundance, diversified character, and numerous uses of its produce, but from the small degree of care and labour required in its culture, and the uncommon facility with which it adapts itself to a great diversity of soils, climates, and situations. One of its varieties (the crab) is a native of our own forests; but the cultivated sorts among us have all been derived from Europe."

The apple is used for the table, for cooking, and making cider. In the selection of sorts, therefore, regard will probably be had to all these objects. But these are so numerous, that no one man in a hundred, and probably not one in a thousand, says another writer, in the same work, possesses sufficient knowledge of the numerous varieties, to enable him to make a judicious selection. One wishes to cultivate the Summer and early Autumn kinds, for marketing; another more remote from towns, would confine his attention io the choice of Winter varieties, or those which yield the first quality of cider, while all are desirous of planting a succession at least for domestic purposes. The synonemes are so numerous of some varieties, that they are scarcely known in two states by the same names. Our tastes are extremely variant. With some, size is every thing; with others colour; and others again regard as material the flavour, the rarity, or the qualities for bearing, or late keeping.

The following list is from the treatise above referred to (*by J. Armstrong, of Dutchess*) and is designed to exhibit those sorts which stand highest in horticultural estimation, for the hardiness and productiveness of the tree, the excellency of the fruit, and the variety of uses to which they may be applied. We have identified the names (so far as we could,) with those given by Kenrick, in his New American Orchardist.

For the table, for cider making, and for cooking.

Golden pippin. A good bearer, fruit fine.

Newtown pippin, good bearer, fruit fine. *Kenrick, 2 sorts, green and yellow Newtown pippin.*

Fall pippin. Great bearer, fruit fine. *Kenrick, Fall pippin.*

Elton pippin. Great bearer, fruit fine.

New Scarlet pippin. Middling bearer, fruit fine.

Padley pippin. Middling bearer. *Kenrick, Padley's pippin.*

Spitzenberg. Good bearer, fruit excellent. *Kenrick, Esophus Spitzenberg.*

Swaar. Good bearer, fruit excellent. *Kenrick Swaar.*

White Calville. Great bearer, fruit fine.

Red Calville. Great bearer, fruit fine. *Kenrick, Red Calville.*

Autumn Calville. Good bearer, fruit fine. *Kenrick, Red Autumn Calville.*

Principally for cooking.

Kentish Russet. Great bearer, fruit fine. *Kenrick, Kentish Broading.*

Beauty of Wilts. Great bearer, fruit fine.

French Crab. Great bearer, fruit fine.

Hollow Eyed. Great bearer, fruit fine.

Cornwall Pearmain. Great bearer, fruit fine.

Keswick Codline. Very great bearer, fruit fine.

Dutch Codline. Great bearer, fruit fine. *Kenrick, Dutch Codline.*

For the table or cooking.

Rennet Frank. Good bearer, fruit fine. *Kenrick, Reinette Franche.*

Grey Rennet. Good bearer, fruit fine. *Kenrick, Reinette Grise.*

Golden Rennet. Good bearer, fruit fine. *Kenrick, Reinette Dore'e.*

Apple trees are liable to depredations from several quarters. Beside those formerly mentioned, with the means of their remedy, the *borer*, a worm which perforates the wood, at the surface of the earth, a little below where the bark is tender, is an enemy to be contended against. If the worms have penetrated the tree, it will be necessary of course, to pick them out; but this may be prevented by a timely application of the wash (potash) before referred to; which has been fonnd an effectual remedy against the borer. It is said that the eggs which produce this insect are deposited from the last of April to the beginning of June (that is during the month of May, so that the latter end of May or the beginning of June will be the proper time to make the application.) Every other year will answer for this remedy, but the horticulturalist will find himself amply repaid by a more frequent application.

The Canker worm.—The female of this insect comes out of the ground very early in the Spring, and ascends the tree to deposit her eggs, which she does in suitable places in the bark, where they are brought forth, and the young brood live on the leaves of the tree. Several methods for subduing them have been tried with some degree of success.

1. Tarring. This must be commenced as soon as the ground is bare of snow, (which is in some years as early as February,) that the first thawing of the ground may not happen before the trees are prepared. A strip of canvass, or linen, three inches wide, should be put round the tree, having first filled the crevices

of the bark with clay mortar; draw it close and fasten the ends strong. A thumb rope of tow should be tied round the lower edge of the strip to prevent the tar from running down on the bark and injuring the tree. Let the strips be plentifully smeared with cold tar, of a proper consistence, to be put on with a brush. It must be renewed once a day without fail. The insects are so amazingly prolific, that if ever so few of them get up, a tree is ruined, at least for the ensuing season. The best time is soon after sunset, because the insects pass up in the evening, and the tar will not harden so much in the night. This work must be continued with care, generally till the last of May.

2. Mr. Nicholson recommends to scrape off the shaggy bark to the width of two or three inches; then make a mixture of oil, or blubber, with suitable proportions of sulphur and Scotch snuff; and lay this on with a brush, forming a ring an inch or two wide; and no insect will ever attempt to pass this barrier as long as the composition has any considerable moisture left in it. Let it be repeated when it inclines to harden; though perhaps this is not necessary.

3. The pasturing of swine in an orchard in the Fall and Spring, has been found very servicable. These animals appear to possess a natural instinct directing to search for vermin and insects, which conceal themselves in the earth.

4. The late Mr. Peck, of Massachusetts, recommends as an effectual remedy, turning up the ground carefully in October, as far as the branches of a tree extend, to half a spade's depth, or five inches, so as completely to invest the surface. Break the clods, smooth the surface with a rake, and pass a heavy roller over it, so as to make it very hard, and without cracks. If the frost should heave and crack the smooth surface in the Winter, it must be smoothed and hardened again in March. This will be found less expensive than the long course of tarring.

5. Dr. Thatcher thinks it highly probable, that a quantity of sea-weed pressed round the trunks of fruit trees, extending three or four feet, would prove a remedy, by forming a compact substance, through which the canker moth and worm would not penetrate.

6. Mr. Kenrick, of Massachusetts, proposes to destroy canker worms by the following method: from any time in June, after the worms have entirely disappeared, until the 20th of October, let the whole of the soil surrounding the trees, to the extent of four feet, be dug up and carted away to a considerable distance; and let there be returned an equal quantity of compost, or rich earth, intermixed with manure. By this operation, the farmer, besides exterminating the worms, promotes the growth and fruitfulness of his trees, and defends them against moles. The author of the

Farmer's Assistant observes, that by taking the earth away from the roots of the trees very early in the Spring, and destroying whatever may appear to be the abode of any insects, and then returning the earth back, mixed with a small quantity of sulphur, sprinkling some of this upon the surface, is, he believes, the most effectual method to keep every kind of insect from ascending.

7. Mr. Knapp, of Boston, has been very sucessful in the application of lime, as follows: Dig the turf, lay the ground smooth, and apply the lime in the Fall. Take air-slacked lime, strew it about an inch thick, to the extent of two or three feet from the roots of the trees. The digging round the trees is *highly* useful, while tarring is injurious. The expense is not great: a man can dig round fifty large trees in a day. The lime is a most salutary manure to the trees. After the spot has been once opened and limed, the labour of keeping it open will not be great. Three hogsheads of air-slacked lime, or sweepings of a lime store, will suffice for fifty trees, and will cost three dollars. As it is done but once a year, he thinks it cannot be half so expensive as tarring.

Mr. Ruggles, of New Haven, Con. says he was some years ago struck with the idea that the capsules of the American chesnut, or chesnut burr, might be applied with advantage to prevent the effects of the canker worm. We accordingly took a piece of strong twine and sail needle, and made a band of them, placing all the backs one way, which caused the spires to project in all directions. We tied this round the trunk of an apple tree, in the centre of an orchard, that was much injured the year before; the tree bore abundantly without the leaves being injured in the least, while those around were all ruined for that year.

He has since tried it several times with entire success. A set of bands will last many years, if taken off when the insects have done ascending, and secured in a dry place. He usually put the bands on the trees about the beginning of March. In places where chesnut burrs are not easily obtained, he thinks the use of the fuller's teasel would answer the same purpose.

The Curculio.—The Curculio is a winged insect or beetle.—The manner in which it injures and destroys fruit, is by its mode of propagation. Early in the Spring, about the time when the fruit trees are in blossom, the curculio ascends in swarms from the earth. They crawl up the trees, and as the fruit advances they puncture the rind or skin, and deposit their embryos in the wounds thus inflicted. The maggot thus bedded in the fruit, preys upon its pulp and juices, until in most instances the fruit perishes, falls to the ground, and the insect escaping makes a retreat into the earth, where it remains until the coming Spring.

Various modes have been recommended and practised to de-

stroy this insect or avert its attacks. One fact mentioned by Dr. Filton, renders it extremely probable that the same remedies might be effectual here, which are prescribed against the Canker worm. He says that two trees of the same kind may stand in the nearest possible neighbourhood, not to touch each other, the one have its fruit destroyed by the curculio, and the other uninjured, merely from contingent circumstances, which prevent the insects from crawling up the one while they are uninterrupted from climbing up the other.

Among the proffered remedies is that of suspending tarred shingles in various parts of the tree, the odour of which is supposed to be repugnant to them. Digging round the trees, in the manner before mentioned, has also been advised. It has, however been observed, that those orchards are most free from their depredations, to which the domestic animals have free access.—Hogs by devouring the fruit that falls, before the insects have time to escape; and poultry, who are great devourers of all sorts of insects, will contribute greatly to this end. Therefore it is that smooth stoned fruits in particular, succeed much better in lanes and yards, where the poultry run without restraint, than in gardens and other inclosures from which they are excluded. Horned cattle also, by trampling and hardening the ground, may be of service to the preservation of fruit. Paving the ground is said to be a very effectual mode of preserving fruit from the attack of the curculio, by preventing its descent into the earth; in which case it finds no Winter habitation. But as this could not be done on a very extensive scale, some flat stones laid around the trees and cemented with lime, might be substituted.

In Kenrick's new and valuable American Orchardist, we find the following excellent remarks on

Gathering and preserving fruit.—"Various theories have been offered for preserving apples in a sound state for winter use, or for distant voyages. Some have proposed gathering the fruit before it is ripe, and drying it on floors before it is put up: this has been tried; apples lose their sprightly flavour, and keep no better than by some less troublesome modes. Dr. Noah Webster has recommended that they should be put down between layers of sand that has been dried by the heat of the Summer. This is without doubt, an excellent mode, as it excludes the air, and absorbs the moisture, and must be useful when apples are shipped to a warm climate. But apples thus preserved are liable to imbibe an earthy taste.

"Chopped straw has also been highly recommended to be placed between layers of fruit; but I have noticed that the straw, from the perspiration it imbibes, becomes musty, and may do more hurt than good. When apples are to be exported, it has

been recommended that each be separately wrapped in coarse paper, in the manner oranges and lemons are put up. This is, without doubt, an excellent mode. And Mr. Loudon has recommended that apples destined for Europe should be packed between layers of grain.

"Great quantities of Winter fruit are raised in the vicinity of Boston, and put up for the Winter use, for the market and for exportation. The following is the mode almost universally adopted by the most experienced. And by this mode the apples, under very favourable circumstances, are frequently preserved in a sound state, or not one in fifty defective, for a period of seven or eight months. The fruit is suffered to hang on the tree to as late a period as possible in October, or till hard frosts have loosened the stalk, and they are in danger of being blown down by high winds; such as have already fallen are carefully gathered and inspected, and the best are put up for early Winter use. They are carefully gathered from the tree by hand, and as carefully laid in baskets. New, tight, well seasoned flour barrels from the baker's, are usually preferred; the barrels being quite filled are gently shaken, and the head is gently pressed down to its place and secured. It is observed that this pressure never causes them to rot next the head, and is necessary, as they are never allowed to rattle in moving. No soft straw or shavings are admitted at the ends; it causes mustiness and decay. They are next carefully placed in wagons and removed on the bulge, and laid in courses in a cool airy situation, on the north side of the building, near the cellar, protected by a covering on the top of boards, so placed as to defend them from the sun and rain, while the air is not excluded at the sides. A chill does not injure them; it is no disservice; but when extreme cold weather comes on, and they are in imminent danger of being frozen, whether by night or day, they are carefully rolled into a cool, airy, dry cellar, with an opening on the north side, that the cold air may have free access—they are laid in tiers, and the cellar is in due time closed, and rendered secure from frost.—The barrels are never tumbled or placed on the head. Apples keep best when grown in dry seasons and on dry soils. If fruit is gathered late, and according to the above directions, re-packing is unnecessary; it is even ruinous, and should on no account be practised, till the barrel is opened for use. It has been fully tried."

Making cider.—From the apple, in our country, we obtain a beverage highly useful. The wines of other countries do not differ more in quality than the cider in ours. And much of this difference arises from improper management, either in grinding the apples, or, what is more common, putting the must or juice

into foul casks, and neglecting or mismanaging it while fermenting.

To make the best of cider, you must have sound fruit, (no rotten apples must ever be admitted), gathered late in the season in *dry* weather, after the middle of October if possible. They should lay in large heaps, covered from the dews and rain, about fourteen days; in which they heat, and throw off a great proportion of their indigested and insipid water, and ripen more uniformly than while on the trees. They must not be ground while they are wet either from the rain, the dew, or from the moisture thrown out by the heat produced by their laying together.

The finer the apple is ground, the more it will yield. If the mill is well fitted, it crushes the seed, and gives a peculiar aromatic bitter to the must, which becomes more and more distinguishable as the cider is longer kept. Some prefer this flavour; others dislike it, not distinguishing it from the bitter of the rotten apples, although very different from that pungent bitter, both in taste on the palate and effects on the stomach.

The pumace should be suffered to stand from six to twenty-four hours, according as you may wish to give a higher or a paler colour to your cider. Its aptness to imbibe foreign tastes renders an exact attention to your vessels of great importance. New vessels, made of seasoned oak, do very well; but those which have been used are better, provided they be kept *sweet* and clean.

How to clean the casks.—When a cask is emptied rinse it with cold water *immediately*, otherwise the lees will sour, and fix an acid that can hardly be removed; and if long continued, dries on the staves so hard as to require much labour in scrubbing it off; in this case it should be whitewashed with lime (which is done by putting about one pint of unslacked lime into a barrel of common size, to which pour three or four gallons of boiling water; shake it well, giving it vent; let it stand till cool, and rinse with cold water. If it still retains the sour smell, let the operation be repeated.)

When it is rinsed perfectly clean with cold water, pour into a hogshead at least six gallons of boiling water. Roll and shake the water to every part of the cask, so as to heat it on all sides. Then pour out the water and lay your cask exactly bung hole downwards, the water running clear and entirely off; the heat in the cask will dry it perfectly. In this state bung it up as carefully as if filled with your choicest liquors, and it will remain perfectly sweet and fit for use in the following season.

It is best, however, to inspect each cask before you fill it. This is done by fixing a candle to a wire three feet long, and letting

down the candle through the bung hole into the cask; you can then see every part of the inside as distinctly as the outside. If they are clean (and tight) it is not best to rinse them with water. It may appear singular to you that so much is said on a case that is plain to every one; but believe me, you may take ten times the trouble in another way, and not effectually cleanse your vessels; and unless they are perfectly sweet, it is impossible to have good cider.

The must or juice of the apple being obtained, the first object is to clear it of pumace; the second, to produce a fermentation to your palate and purpose.

To clear the liquor of pumace, most farmers do nothing more than strain it through straw. It ought to be strained through a hair sieve, or run through sand. The mischief of pumace left in the liquor is, that it produces an *excessive fermentation*, by which more cider is injured than in any other way.

Another way to free the liquor of pumace, practised by some of our best farmers and much recommended, is putting the liquor into large open vessels or vats, with a tap and faucet near the bottom, by which to draw it off. Hogsheads, where they can be had, with one head out, will answer the purpose. In these open vessels it is to stand *till the first appearance of fermentation*, which may be sixty hours; or it will be sooner or later according to the degree of heat in the air at the time.

During this period the heaviest of the pulp sinks to the bottom; the larger and lighter parts rise to the surface in scum, where it remains until the fermentation begins; but the fermentation would involve great part of the pulp, both from above and below, into the body of the liquor, and increase the fermentation beyond our control. It must therefore be removed before this effect be produced. Soon after the fermentation begins, the covering on the top of the must or liquor cracks and separates, when there is not a moment to be lost before you draw it off into your casks, leaving the pulp behind.

Fermenting of cider, fining and bottling.—There are three fermentations of which cider is capable; first, the *vinous*, which produces the alcohol or spirit that gives the liquor its stimulating and exhilarating qualities; second, the *acid*, which turns the cider to vinegar; third, the *putrid*, which utterly destroys its use, and reduces it to a nauseous and poisonous liquid. The principal object in making good cider is, to stop the working of the cider as soon as the vinous fermentation is completed. The cider in our country, as it is usually managed, rarely stops at this stage. Nine times out of ten, it is far advanced to the vinegar state.

The fermentation should be slow; in order to this the medium

heat of the day should never exceed forty-eight degrees of Fahrenheit's thermometer. But as farmers, generally, have no thermometers, it may be sufficient to notice, that this temperature of the air does not usually take place in our cellars before November, which generally affords the best season for making and storing cider.

To check the fermentation when becoming too violent or too long continued, rack or draw off the cider from the lees into clean casks, in which, when about half filled, should be burnt some matches of sulphur, and the fumes incorporated with the cider by shaking and turning the barrel. When the air in the cellar *is* fallen to forty-six degrees or lower, it is fit for the reception of cider.

During the whole time of fermentation the casks must be kept full, so that the yeast, pulp, gas, or whatever you please to call that matter which rises in fermentation, may be thrown out of the cask and not return into the liquor, for if it does, it operates as yeast, renews the fermentation, and will destroy the cider.

If racking or drawing off the cider has not been done sooner, it should never be delayed longer than till February, as if suffered to stand on the lees through the Summer it will most certainly injure the cider. To fine or clarify cider, isinglass, the whites of eggs, and calves'-feet jelly, are all made use of. This, however, need not be done, unless the cider is wanted for bottling or for market, as good cider will generally fine itself, in its own time.

One ounce of isinglass, as it is called, which is nothing else than fish glue, dissolved in two or three quarts of cider, and strained, is sufficient for one barrel. This must be well mixed with the cider by a stick introduced at the bung. Leave the bung out, and it will usually fine in eight or nine days, after which, if desired, it may be drawn off into bottles, or otherwise into clean casks, as it must not remain above ten or twelve days at most on the finings.

Cider when fine will be perfectly clear and transparent; till then it is not fit for bottling. The bottles must be dry; a few drops of water would spoil a bottle of cider. The corks before driving should be dipped in cider, and driven with a wooden bat, turning the nose of the bottle down, so that the cider shall come in contact with the cork, otherwise there will be danger of breaking the bottles. A tea-spoonfull of brandy added to each bottle, is said to have a good effect in lessening the fermentation, and thereby preventing the bottles bursting. Bottles when put away should be laid on their sides, that the corks may be kept swollen so as to prevent any escape of gas.

If cider is to be kept in casks after May, early in the Spring

cover the bungs with rosin, or cement of some kind. To do this open a spile hole while the cement is laid on; otherwise no art can cover the bung effectually; the air from within will force up the cement through the smallest passage, and disappoint a thousand attempts to fill it up. When covered and the cement cooled, make the cask tight by driving an oak spile into the hole.

"Farmers," says Mr. Lowell, "drink a miserable liquor instead of an excellent one which they might have: they obtain a reduced price for the article, in consequence of the bad state in which it is brought to market. If they should reduce the liquor into a *vinous and refined* state, before it is carried to market, they would obtain five and even ten dollars a barrel instead of three.

"Something, too, must be allowed for the addition to their own comfort and enjoyment. With three days' labour of one man, forty barrels of cider may be sufficiently attended to, racked one or more times, the casks rinsed, and stummed with sulphur; then the farmer would never have to resort to foreign liquor to regale his friends. A good bottle of cider is often equal to the best champaigne, the most popular wine in France."

Vinegar.—The principal requisites to form good vinegar, are, 1. Contact with the air; 2. A temperature not exceeding 20 degrees of Reaumur (77 of Fahrenheit); 3. The addition of some extraneous vegetable matter to promote the acetous fermentation; and 4. The presence of alcohol. Vinegar can be made from cider, from the juice of currants, from sugar and water with a little whiskey; a cask that has been used to keep vinegar in, is the best cask to make it in. If cider is too weak, add half a pound of sugar and half a gill of whiskey to each gallon, and set the cask in the sun, covering the bung hole slightly to admit the air, and exclude the dust.

Vinegar, however, is best made thus: to a quarter cask of good cider, add 4 pounds of white Havana sugar, and half a pound of argol or rough tartar in fine powder; it will be better for the addition of some lees of wine; expose it to the heat not less than 75 degrees nor more than 80 degrees, with the bung out. Twice or thrice a day, draw off a pailfull, and after it has stood exposed to the air a quarter of an hour, return it into the bung hole by a funnel.

The method of imitating wine vinegar in the English manufactories, is as follows. In a long room, quarter casks of cider placed upright, side by side, raised above the floor about twenty inches, occupy all sides of the room, which by means of stoves is kept at a temperature of about 80 degrees of Fahrenheit. The top of the cask is bored full of holes; on each cask is placed a tub holding about half a bushel or more of Malaga raisins.

The sole occupation of the man who attends the room, is to go round incessantly, and draw a pailfull from the bottom, and pour it upon Malaga raisins; the cider percolates through the raisins, and runs into the cask by means of the holes in the top. This gives the wine flavour and body. The operation takes about a fortnight according to the strength of the cider; when this is weak, sugar and powdered tartar are put in. The tartar certainly adds to the strength of the acid, and also to the vinous taste, but the acid of tartar is by no means so wholesome as the acid of vinegar. Tartar can be discovered by means of sugar of lead: the tartrite of lead precipitates; the acetite of lead is soluble.

THE PEAR TREE.—Of the pear tree as well as the apple tree, there are many varieties: as these do not re-produce themselves from the seed, and as the plant furnished by layers, cuttings and scions, are very indifferent, the pear tree is usually propagated by scions and buds. They may be grafted on quince or pear stocks. The best fruit is usually produced from quince stocks; but though finer in quality, it is not so abundant in quantity as that produced from pear stocks.

We give the following from Mr. Kenrick's select list of fruits, as contained in his New American Orchardist. Those who would be more particular, will do well to consult that book.

Summer fruit: Green Chissel, Early Rousselet, Jargonelle, St. John's, Skinless.

Autumn fruit: Andrews, Bartlett, Capsheaf, Dix, Dutchess D'Angouleme, Fulton, Gore's Heathcot, Harvard, Golden Beurre of Bilboa, Marie Louise, Napoleon, Wilkinson.

Winter fruit: Diel, Lewis, Passe Colmar.

Winter baking Pear: Catillac, Pound.

A pear tree should be left pretty much to its own growth. It may, however, sometimes be necessary to apply the knife, in which case it should be merely to keep the head of the tree tolerably well open in the middle, and to preserve its pyramidal shape, by shortening the wood on that side where it grows too luxuriantly.

Diseases.—The pear tree is liable to injury from the *slug-worm,* which usually appears on the upper surface of the leaves, in the month of July. They may be easily destroyed by sifting air-slacked lime over them. The *curculio,* is also an enemy of the pear tree; and may be treated in the manner already described under the head of the apple tree. The fire blight is another serious disease which often attacks this tree.

"One reason," says Mr. Goodsell, "why horticulturists have

not made more satisfactory discoveries as to the cause of this disease is, that they have not commenced their examinations sufficiently early, and have been led to watch the progress of it after the first cause has ceased to operate.

"I am inclined to think that careful examinations will support the following conclusions.

"*First*—That the blight in Pear, Apple, and Quince trees, is occasioned by an insect.

"*Secondly*—That it is communicated to the pistil of the flower at the time that organ is in its greatest perfection, or during the expansion of the flower.

"*Thirdly*—That it gradually spreads from the point of infection to other parts of the tree, in a manner similar to mortification in the animal kingdom.

"*Fourthly*—That it is as capable of being communicated by inoculation as the small pox.

"*Fifthly*—That no tree has it, unless by inoculation, until it has produced flowers.

"In support of the first conclusion, so far as we have observed this disease, it has spread from the place where it first commenced in an orchard in every direction, without reference to the general course of the wind at the time; and as the Quince does not come into flower until after the Pear has shed its flower, it cannot be attributed to an intermixture of pollen from the pear tree.

"That it commences at the point of the pistil has been evident from every case we have examined, before the different parts of the flower are decayed. It often appears that not more than one flower in the cluster is infected: the fruit of the infected flower does not swell as the others, which continue their growth, until the mortification has by degrees descended through the stem, to the woody part of the fruit spur, over which it spreads, and ascends the stems of the remaining part of the cluster, which may readily be observed, by a discolouration of them as it advances. In this section of the country the disease will be found to have advanced thus far by the first of June, when the leaves on the fruit spur, so affected, will be found withering.—After this, the rapidity with which it spreads, depends on circumstances. Where there is the greatest quantity of alburnum, or elaborated sap, the disease spreads with the greatest rapidity, which is increased by the state of the atmosphere; as in warm moist weather it progresses further than when dry and cool.

"It is not till the middle of June, that this disease begins to manifest itself to superficial observers. About this time the mortification from the fruit spurs, will have reached the limbs; and

where they are numerous, and most of them affected, they will in a short time destroy the branch, so as to cut off all communication between the bark and wood. As the ascending sap passes through the sap-wood to the leaves, before it is elaborated, this communication is not cut off until later in the season, and the outer ends of the limbs remain green, until the disease has penetrated the wood; at which time the ascent of the sap is cut off, and the whole limb becomes discoloured in a short time, often in the space of a few hours.

"We do not pretend to be such an adept in the science of vegetable pathology, as to be able to describe the manner in which the virus of this disease acts upon the healthy parts of the tree; but of this we are satisfied, by repeated experiments, *that it is as capable of being communicated by infection as the small pox or any disease to which the human family is subject.* The manner in which we have conducted these experiments is as follows: We have taken the discoloured vivid matter from between the bark and wood of a diseased limb, and put it beneath the bark of a healthy tree, in some instances covering the wound with a strip of rag, which had been dipped in melted grafting wax, in others leaving the incision open; in some instances the quantity of *virus* introduced into the healthy tree was not greater than would be used to inoculate a person for the small pox; and yet in every instance, within from three to five days, the disease has shown itself spreading the same as in a tree which had it the '*natural way.*'

"Trees do not have it the natural way until they have put forth blossoms. We have repeatedly seen young trees growing near those which were in a diseased state, which remained in perfect vigour, and this present season we have examined one which was of a large size which had never produced any blossoms before, and this year only upon one small limb, which produced one dozen bunches of flowers, nearly all of which were diseased, so that we think by the first of July the limb will have turned as black as if it had been scorched by fire.

"Amputation is the only remedy known at present. As soon as the disease is observed, the limb should be cut off below where it can be discovered, in doing which the operator should remember that the smallest quantity of *virus* is sufficient to communicate it to a healthy part, if brought in contact between the bark and the wood; he should, therefore, be careful not to use an instrument for amputation which has been used to examine the diseased parts, unless it has been thoroughly cleansed.

"We have been thus lengthy in regard to this disease, because it is one of vital importance to every farmer who would cultivate a valuable orchard, or is fond of this delicious fruit."

THE PEACH TREE.—A rich sandy loam is the soil best suited to the peach tree. If the soil be not naturally of this description, a bushel or two of sand thrown around the root of the tree at planting will greatly improve it. Some writers say the ground should never be manured with stable dung. If the ground is very poor, let some good mould from the ditches, or hill sides, &c. be applied. Manure is said to spoil the flavour of the fruit, and to cause it to rot prematurely. The land for cherries, pears, and apples, cannot be too rich, but it is otherwise with the peach. "The largest and finest peaches I have ever seen," says an experienced cultivator, "(the heath and yellow Canada,) were raised on a soil, that would not have produced more than ten or twelve bushels of corn to the acre."

Peach trees are usually inoculated on the peach stock; they are however sometimes propagated on the plum or almond stock. They may be planted from ten to twelve feet apart. The ground should not be stirred about them when the fruit is on; but according to some, the cultivation of the ground is highly useful at other times.

"In our climate," says Kenrick, "the peach is almost universally cultivated as a standard. They are rarely pruned at all; they are sometimes, however, renovated by heading down; this operation should be performed, just before the sap rises in the Spring." Another writer says, "of all the fruit trees produced in this climate, none bears pruning so freely as the peach; indeed it should be treated very much as the vine is. All those branches which have borne fruit should be cut out, if there is young wood enough to supply their places. In proof of which he says, if you take a limb which has borne two or three crops of fruit, and observe its produce; then take another of the same tree, which has never borne at all, and the fruit on this last will be twice the size of the former, fairer, and less liable to rot. In pruning, the branches should be taken or cut out of the middle of the tree, to give more air and sun to the fruit on the outer limbs.

Peaches are either of the *free stone* or *cling stone* kind.

We give a list of the approved sorts of each, arranged according to the order of their ripening.

Free stones.—Grosse Mignone (red rare ripe), Belle Chevreuse, Double Montagne, Bellegarde, Late Purple, Morrisania Pound, &c.

Cling stones.—Early Newington, Congress, La Fayette, Oldmixon Clingstone, Pavie Admirable, Heath, &c.

Peach trees are destroyed by a worm which feeds on the inner bark of the tree, at its root. This worm is said to be the offspring of a fly of the wasp kind, which deposits its eggs in

the bark of the root of the tree while it is yet tender and young. The remedy consists in searching for the opening in the bark at the root, and taking them out. If this operation is repeated three or four Springs, the worm never after can make a lodgement there. The bark of the tree by this time becomes so hard, that the fly cannot make the puncture in order to deposit the egg, or if deposited it perishes. After the worm is cut out in the Spring, draw the earth up around the body of the tree, six or eight inches above the other ground.

There are several other ways prescribed to remedy this evil. Unleached ashes applied around the root of the tree about the beginning of June, being formed into a small mound, will protect the tree where the bark is most tender. This should be levelled in October, to give the bark an opportunity of hardening. It is suggested that the wash of pot-ash, heretofore described, might, by a proper application, at a suitable time, after the deposition of the eggs of the insect, prevent their generation.

Mr. Ellis, of New-Jersey, prevents the injury arising from the worm by the use of rye straw. In the Spring when the blossoms are out, clear away the dirt so as to expose the root of the tree to the depth of three inches; surround the tree with straw about three feet long, applied lengthways, so that it may have a covering one inch thick, which extends to the bottom of the hole, the but ends of the straw resting upon the ground at the bottom. Bind this straw round the tree with three bands, one near the top, one at the middle, and the third at the surface of the earth; then fill up the hole at the root with earth, and press it closely around the straw. When the white frost appears the straw should be removed, and the tree remain uncovered until the blossoms put out in the Spring. By this process the fly is prevented from depositing the egg within three feet of the root; and although it may place the egg above that distance, the worm travels so slow that it cannot reach the ground before frost, and therefore it is killed before it is able to reach the tree.

When the *curculio* attacks the peach tree, let it be treated as before recommended.

The *yellows* is a disease of a more serious nature; for as neither the source nor the precise character of the disease is understood, it has hitherto baffled every endeavour to subdue it. The yellows is capable of being communicated from one tree to another, and the consequence is certain death. A knife, which has been used in pruning a diseased tree, will communicate it to a healthy one. It will spread through a whole orchard, like a contagion, as it is, if the trees infected be not immediately destroyed. This, therefore, is the only remedy yet known. As the time of blooming in the Spring is supposed to be the period

of taking the disease, all trees, when discovered to be infected, should be previously removed.

Peach trees are also liable to be injured by the bursting of the bark from severe frost in wet Winters, and the splitting off of the limbs at the fork of the tree. The first is to be prevented by planting the trees where the water will readily run off; and the second, by proper pruning and attention.

APRICOTS AND NECTARINES.—The culture of these trees is in all respects like that of the peach, and will not therefore be separately treated of.

THE PLUM TREE.—The plum tree delights in a soil like that of the peach—neither too dry nor too moist.

The varieties are propagated either by inoculation on plum stocks, or from seed. Those produced from the seed are preferred.

In favourable climates it should always be cultivated as a standard, and will then require only a little annual labour about the roots, and the removal from the head of dead and dying branches.

Some plum trees are liable to be attacked by a worm, which occasions the formation of large bunches on the limbs. These diseased limbs are to be removed and burnt, and even the whole tree if it should be badly infected, to the end that it may not communicate to others.

The best recommended sorts are—the Prescoe of Tours, Early Damson, Green Mirabelle, St. Catherine, White Perdrigon, Imperatrice, and all the Gages—Blue, Violet, and Green.

THE CHERRY TREE.—Cherry trees are propagated by budding and grafting, unless to produce stems or new varieties, when the seeds are sown in Autumn. The soil required is similar to that for the peach. Cherry trees do not require much pruning.

The sorts to be preferred are—the May Duke, Early Black, large Black-Heart, Frazier's Tartarian, the Elton, Bleeding Heart, Cerone, Black Gean, Florence, Amber Heart, and the Morello.

THE QUINCE.—There are several varieties of the quince, called the Apple, the Pear, the Portugal, &c. Of these, the latter is considered the best.

The quince is propagated by seeds, layers, cuttings, and suckers. But the surest and most usual way, is by cuttings.

They require a rich and moist soil, and a sheltered situation.

When they are once growing, little further attention is required than to remove useless suckers, and dead or decayed wood.

ORNAMENTAL TREES.—There is no country of the globe which produces a greater variety of fine forest trees, whether considered for the purposes of ornament or timber, than North America. Yet it is a fact, that for both these purposes, more particularly the first, they are horticulturally better known in many parts of Europe, than they are now at home. Those governments have imported the seeds of all our most valuable forest trees, annually, for more than a century. Instead of planting, our agriculturists have hitherto been engaged in destroying. In the Atlantic States, this period is now past; and we would, therefore, first direct the attention of the arboriculturist to our own trees,

There is in the whole catalogue, scarcely a more interesting object than an immense oak tree, when so placed as to be considered in relation to the large mansion of a wealthy proprietor. Its broad ample limbs and aged form, give a very impressive air of dignity to the whole scene. It is a very common inhabitant of our woods, there being 44 species of indigenous growth between the 20th and 48th degrees of north latitude. The pendulous branches of the American Elm—the light foliage of the birch—the cheerful vernal appearance of some of the species of maple—the delicate leaf of the locust, and the heavy masses of verdure produced by the beech, are sufficient to render them all ornamental in park scenery, and they should ever find a proper situation in an extensive lawn. Our American poplars should be recollected, when a rapid growth and immediate effect is required. *Gleditschia triacantha*, or the sweet locust, is interesting from its long masses of thorns. One of our most ornamental trees, both in foliage and flower, is the white wood, *Liriodendron tulipifera*. Its erect, tall form, large yellow blossoms, and handsome leaves, have rendered it an universal favourite in Europe, and there can scarcely be a more stately object to stand as an isolated specimen. The plane or sycamore (*Platanus occidentalis*) is too much neglected, because it is so common; but in favourable situations, in deep soils, and where ample room is afforded, it produces a noble tree of immense size. Several have been measured on the banks of the Ohio from forty to fifty feet in circumference.

A native tree but little known in our ornamental plantations, is the Kentucky coffee, *Gymnocladus canadensis*. It is a native of Kentucky and Tennessee, grows to the height of forty feet, and its doubly compound foliage, and very singular appearance when defoliated in the Winter months, are well calculated to

render it an interesting feature in the landscape. *Cupressus disticha* (*Taxodium* Richd.) the deciduous Cypress, flourishing in vast quantities in the southern parts of the Union, is, though perfectly hardy and of easy cultivation, but little known in the Northern states. Its beautiful light green foliage contrasts elegantly with the denser hue of other deciduous trees, and we are hardly aware of an upright growing tree, better calculated to give variety of colour to groups and masses, than this. *Catalpa syringafolia* (Catalpa tree) is a most striking ornament to a lawn, when in the Summer months it is loaded with its large clusters of parti-coloured flowers.

But the most splendid, most fragrant, and most celebrated ornamental production of the woods and forests of our country, is yet to be mentioned. It is the unrivalled *Magnolia grandiflora* (Great flowering Magnolia), the most magnificent of the genus, a beautiful tree of seventy feet in its native soil, only attains the size of a large shrub in the middle states, and will scarcely withstand the Winters of the northern. But *M. accuminata* (blue flowering), though not so beautiful, is a fine large tree, sometimes attaining the height of ninety feet. It is abundant in western New York and Ohio. *M. macrophylla* (large leaved), is not only remarkable for the beauty of its flowers, but also for the extraordinary size of its leaves; they having been measured so long as three feet. *Magnolia tripetala* (the umbrella tree), is also a fine species, growing in districts from Georgia to New-York;—its large cream-coloured flowers measure 7 or 8 inches in diameter. Still more rare though highly ornamental, are *M. cordata* (yellow flowering) and *M. auriculata*, small trees which ought to be indispensable to every collection. The species of smallest stature and most frequent occurrence in the middle states, is *M. glauca* (Beaver tree), the flowers of which are highly odoriferous. It succeeds best in damp soils, and is found very plentifully in situations of this kind in New-Jersey.

Ornamental trees from other countries should find a prominent place in the plantations of our horticulturists. They not only have an intrinsic value in themselves, but to a refined taste they offer gratifications from the associations connected with them. Thus the proprietor may view in the walks over his grounds, not only productions of his own country, but their fellows from many other climes. We may witness flourishing upon the same soil, many of the productions of southern Europe and Asia; individuals from the frigid regions of Siberia, and the almost unknown forests of Patagonia; vegetables which perseverance has abstracted from the jealous Chinese, and which the botanical traveller has discovered among the haunts of the savage Indians.

Among the foreign trees which are most generally cultivated for ornament in this country, we may mention the two genera of *Tilia* and *Æsculus*. The European Lime or Linden tree, with its fine stately form and fragrant blossoms, is a most pleasing object as an ornamental tree. The Horse chesnut (*Æ. Hippocastanum*) is perhaps better known than any foreign tree in the country; its compact growth, fine digitale leaves, and above all, its superb, showy flowers, distributed in huge bouquets over the foliage, have rendered it here, as in Europe, an object of universal admiration. We would here beg leave to direct the attention of planters to the less known, but not less interesting species of this tree, natives of our own soil: *Æsculus paira* producing red, and *Æ. flava* yellow flowers, from very beautiful trees of moderate size. The other species are rather large shrubs than trees, and are very pretty ornaments to the garden.

The brilliant appearance of the European Mountain Ash (*Sorbus aucupara*), when in Autumn it is densely clad with its rich crimson fruit, is a circumstance sufficient to give it strong claims to the care of the arboriculturist, independently of the beauty of its foliage. But a tree, which from this latter property has long been a favourite with us, and which, though it is common in Europe, we regret to say is yet but half so well known as it should be, is the silver-leaved Abele, *Populus Alba*. Its growth is very rapid, and it is, therefore, well adapted for planting where time is an object of consideration. The flowers are insignificant, but its leaves are highly interesting. The under side of each of these is rendered perfectly white by a dense cottony pubescence, and in a gentle breeze, from their being supported on slender petioles, they are in constant motion. At a moderate distance, to a spectator standing on the windward side, they give it frequently the appearance of being covered with a profusion of white flowers. It has a beautiful effect from the house when seen at some distance in the foreground of a handsome group of trees of a darker green. Added to this, it holds its foliage unscathed by the frost, until the very latest period in Autumn.

Alianthus glandulosus, the heaven tree of the Chinese, is a fine stately tree, and though introduced from a warmer climate, bears the intense cold of our Winters perfectly uninjured. When young it somewhat resembles our sumach, but when it attains the height of 90 or 100 feet, with its long, pendant, pinnated foliage, it will form a very picturesque and graceful object.

We must not forget in this brief notice the Larches both of Europe and our country. *Pinus larix* (Larch) has long been considered among the first timber trees of the other continent. The singularity of its foliage as a deciduous tree, its long, declining

branches and drooping spray, are well calculated to give variety to the landscape, and we are happy to see, that both this and our two American species, *P. microcarpa* (red larch), and *P. pendula* (black larch), are becoming more generally objects of attention and cultivation.

Among the interesting trees of more recent introduction and which are yet rare in this country, we may mention *Salisburia adiantifolia*, the Japanese maiden hair tree. The foliage is strikingly beautiful, resembling that well known fern *Adiantum pedatum*, and the tree appears to be very hardy. The purple beech, a variety of *Fagus sylvatica*, is a very unique object with its strangely coloured leaves; and a very splendid tree lately introduced from the banks of the Missouri and Arkansas, is the Osage orange (*Maclura aurantiaca*). Its vivid green leaves and rapid growth are already known to us, but it is described as being a tree in its native soils of thirty or forty feet in height, and bearing abundance of beautiful fruit of the size and appearance of an orange. The weeping ash is also a very unique and desirable object, and its long seemingly inverted shoots may be introduced in some situations with an excellent effect.

We have often regretted that in decorating the grounds of country residences, so little attention is paid by the proprietors to hardy evergreen trees. Ornamental at any season, they are eminently so in Winter—a period in this latitude when every other portion of vegetable matter yields to the severity of our northern climate, and when those retaining their coats of verdure uninjured are beautiful and cheerful memorials of the unceasing vitality of the vegetable world. Deciduous trees at this season present but a bleak and desolate aspect—a few evergreens, therefore, interspersed singly over the lawn or tastefully disposed in a few groups so as to be seen from the windows of the mansion, will give a pleasing liveliness to the scene, which cannot fail to charm every person. We would earnestly advise every person engaged in ornamental planting, to transfer some of our fine native evergreen trees to their lawn, park, or terrace. We are aware that many think that there is great difficulty in transplanting them with success, but experience has taught us that with the following precautions no more difficulty is found than with deciduous trees. In transplanting choose the Spring of the year at the time the *buds are swelling; cut as few of the roots as possible, and do not suffer them to become dry before you replace them in the soil.* Among our most ornamental evergreen trees may be mentioned the different species of pine, natives of N. America.—Several of them are fine stately trees, and one which is particularly ornamental as a park tree is the white or Weymouth pine, *Pinus strobus*. *Pinus rigida*, when old and large, is a very pic-

turesque tree; and *Pinus alba rubra et fraseri*, the white, red, and double spruce firs, are trees of moderate size, very generally diffused in the middle states, and easily obtained. The well known balsam fir, *Pinus balsamea*, is such a beautiful evergreen, and succeeds so well in this climate, that it should find a place in the smallest plantations. We have observed it thriving well even in confined spaces in cities. *Thuija occidentalis*, the arbor vitæ, is a very interesting tree, and as well as the exotic *T. orientalis*, will be considered very ornamental in districts where it is not common.

Among the most ornamental foreign corriferous trees, we will notice the Norway spruce, the drooping branches of which in a large specimen are so highly admired—the well known Scotch fir, the finest timber tree of Europe, celebrated for growing on thin soils; and the beautiful silver fir, *Pinus picea*; all of them are noble trees, and as they can be readily procured at the nurseries should be found in the grounds of every country residence.

Several other species of this genus, though the most beautiful trees of Europe, are unfortunately yet scarce in this country: the stone pine, whose seeds are a delicious fruit, and whose "vast canopy supported on a naked column of immense height, forms one of the chief and peculiar beauties in Italian scenery and in the living landscapes of Claude," and the not less interesting *Pinus pinaster* and *P. Lembra* of the mountains of Switzerland. But the most desirable evergreen tree which flourishes in temperate climates, is the classic cedar of Lebanon, *Pinus cedrus*. Its singular ramose branches and wild picturesque appearance in a large specimen, give a more majestic and decided character to a fine building and its adjacent scenery than any other tree whatever. It is a native of the coldest parts of Mt. Libanus, but according to Professor Martyn more trees are to be found in England at the present time than on its original site. As it is scarcely yet known as an ornamental tree in this country, we certainly do not know of an object better worth the attention of the arboriculturist.

Forest Trees.—A timber tree is valued for its length, straightness, and solidity of stem. Judicious pruning tends greatly to assist nature in the formation of the stem in this perfect state. In natural forests, boles or stems possessing properties of the most valuable kind are found, where no pruning, trenching, or any other process of culture ever was applied to the rearing of the trees. It should not, however, be concluded from this circumstance that the processes are of little value. If we examine the growth of trees, when left to the unassisted efforts of nature by the neglect of pruning and thinning, we find

that but a small number only, on any given space of planted ground, attain to perfect maturity, compared to those which never arrive at any value but for fuel. The like results, though varying according to local advantages, are exhibited in the produce of self-planted forests. Hence, instead of an average of two or three perfect trees on any given space (suppose an acre) left to the unassisted efforts of nature, we shall have from forty to three hundred perfect trees, according to the species of timber, by the judicious application of art in the preparation of the soil, and the after culture of the trees, and probably on soils, too, which, without such assistance, could never have reared a single tree.

The time at which pruning should begin, depends entirely on the growth of the young trees. In some instances of favourable soil and quick growth of the plants, branches will be found in the course of four or five years to require foreshortening, and in case of the formation of forked leaders, to be pruned off close to the stem. When the lateral branches of different trees interfere with each other's growth, pruning, so as to foreshorten, should be freely applied in every case, in order to prevent the stagnation of air among the branches, or the undue preponderance of branches on one side of the tree. Perfect culture, in this respect, requires that the plantation should be examined every year, and by keeping the trees thus in perfect order, there will never be any danger of making too great an opening, or depriving a tree too suddenly of a large proportion of branches. The operation will also be so much more quickly performed, as to render the expense of management less than if the pruning was delayed, or only performed at intervals, as is too frequently practised.

By examining the trees of a plantation annually, the critical time for pruning every branch for the best interest of the tree is secured. Some trees may be pruned with great advantage successively for years, while others may only require it every three or four years, and others again not at all.

Judicious thinning may be said to be productive of the same valuable effects to a plantation of timber trees in the aggregate, as those which judicious pruning produces on every individual tree composing it: by the admission of a proper circulation of air and the solar rays, and permitting the free expansion of the essential lateral branches of the trees, as well as by preventing an unnecessary waste or exhaustion of the soil by the roots of all supernumerary trees.

The great advantages of judicious thinning are not confined to the object of obtaining the largest quantity of timber of the best quality on a given space of land, in the shortest space of time; but the produce of the trees thus thinned out ought to afford a

return sufficient to pay the expenses of culture, interest of capital, and the value of the rent of the land. In many instances, the profits arising from the thinnings of well-managed woods have covered these charges before the period of twenty years from the time of planting. The time at which the process of thinning should be commenced, depends on the like causes as those which regulate pruning, and need not here be repeated.

In general, the forest growing plantations require to have a certain number of trees taken out by the time they have attained to eight years of growth from planting. On forest tree soils of a medium quality, the age of ten or twelve years may be attained by the young trees before thinning is necessary; but should fifteen years elapse before the trees demand thinning, it will be found that the plantation has been imperfectly formed.

No certain rule can be given to determine the number of trees to be thinned out periodically, which will apply to all plantations and to every kind of forest tree in them. A well grounded knowledge of the principles of vegetable physiology, and of the habits of trees, is absolutely essential, to execute with success this very important branch of arboriculture.

CHAPTER II.

THE KITCHEN GARDEN.

FORMATION OF THE KITCHEN GARDEN.—If there is one department of gardening more useful than others, it is that of which the special object is the production and cultivation of those vegetables which so largely contribute to the support of man. The poor as well as the rich, the prince and the peasant, are alike indebted to this branch of horticulture for the larger and more wholesome part of their subsistence: to all, a garden is possessed of a certain degree of importance; and all have an interest in giving to it as high a degree of cultivation as possible, in order the better to supply their wants. The culinary garden is of importance to the public, particularly in large cities; and where a proper spirit of improvement has been abroad, we find their environs occupied chiefly by market gardens, which, independently of furnishing the tables of the inhabitants with the most wholesome food, afford an honest occupation and the means of support to a large class of the population. They are thus doubly beneficial.

Important as the formation of gardens is to those "who dwell in çities, it is not less so to the farmer. Every farm-house, every cottage, should have a garden (larger or smaller according to the means of the owner) attached to it. The necessity of a garden is not generally disputed. Almost every farm-house has a garden of some sort: but there lies the difficulty—it is in reality a garden of *some sort*, but unfortunately not always of the right sort. The farmer generally appears to think a garden beneath his notice: he leaves the care of it to "the women"—an arrangement which would answer admirably well, if he would only provide "the women" with the means of attending properly to the duty thus delegated to them. This negligence is prejudicial to the farmer's interests, as well as to his comforts and enjoyments. The necessity of having a garden being acknowledged, the choice rests between having a good one or a bad one. A garden will always well repay the attentien and labour bestowed upon it,

provided that attention be properly directed, and the labour rightly applied.

As a preliminary it may be observed, that "whatever is worth doing at all, is worth doing well." It requires but little more outlay, either of money or labour, in the beginning, to make a good garden than to make a bad one, and will cost less in the end. If there be any thing in figures, or truth in arithmetic, an article which will cost $5 and last twelve months, is cheaper than one which costs $3, and will last but four or at most six months. So it is with a garden: make it right at first—spare no labour nor expense to make it well, and it will endure; but if you begin wrong, or do the work negligently, you lose both your time, money, and labour, and will at length be obliged to begin all over again.

The first point is to make choice of a situation (provided that a choice is to be had); for sometimes the situation of the house or some other circumstances will take away that choice, and it will be necessary to locate the garden to suit such circumstances. But where a choice is to be had, it is of great importance to fix upon a favourable situation; for on that depends the prospect of luxuriant and profitable crops. It is even of more importance than choosing a rich soil: for if the soil be poor and the situation good, the former inconvenience may be remedied; but if the situation be bad, the defect is irremediable. The kitchen garden should be placed at the back of the dwelling-house; but it should not be cooped up among buildings and outhouses of every kind, as is too often the case. Farmers will generally find it best to have their gardens adjoining their houses, as these are for the most part plain and simple; but in the country seats of the wealthy, where the principal dwelling has many offices, &c. attached, it will be of advantage to have the culinary garden situated at some distance from the mansion house: it will not then interfere with the arrangements of the pleasure grounds, which the proprietor will be more at liberty to dispose in such manner as his tastes and circumstances will suggest, without neglecting or disparaging the more useful department.

In choosing a situation, due regard should be had to *shelter*, a certain degree of which is necessary: it renders the garden warmer, and protects it from cutting winds, which are productive of much injury. Should the garden spot be exposed to inclement winds from any quarter, no time should be lost in planting trees, which may afford a shelter from these troublesome visitors. Of course, as the object is to procure shelter as soon as possible, trees of rapid growth are obviously preferable. Care must be taken, however, not to run into an extreme, and overshade the ground by lofty trees; in planting the trees for shelter, therefore,

it will be best to plant them at some distance from the boundary of the garden. Wherever a situation can be had already protected by nature, it must not be neglected; for a natural shelter is always better than an artificial one: such natural shelter may be caused by the form or situation of the ground. But if recourse must be had to an artificial one, let it be attended to soon. The earth should be well trenched, and trees planted immediately. The Sycamore or Button-wood may answer very well, as it grows freely; poplars are of yet more rapid growth, but they are objectionable on account of their long straggling roots: if used at all, care should be taken that these voracious appendages do not interfere with the borders. To these may be added trees of slower growth and greater durability, as oaks and elms; the chesnut may also be introduced advantageously, as it would under such treatment attain a large size, and produce fruit of superior quality, which is certainly an object, when it often sells at from $3 to $6 per bushel. It should be borne in mind, that the best shelter for Winter is formed by evergreen trees, as they retain their leaves; a large proportion of them should therefore be distributed among the other trees, and when they have attained a proper size some of the deciduous trees may be cut off, and if a few only of the finest of the latter be left at judicious intervals, the effect will be highly ornamental.

The distance from the line of the garden at which these trees should be planted, must be regulated by circumstances; at the south and east they should be as far removed as possible, to keep their shadows out of the garden during the Winter.

One word more as regards these plantations: be sure, in choosing your trees, to give the preference to those plants which have been grown from seed, before those which have been raised from cuttings or layers, and above all from suckers; the latter having always a tendency (greater or less, according to circumstances) to an irregular growth; whilst the former are more likely to assume the form of handsome trees.

This is a general rule, but it applies in an especial manner to evergreens. It is well known, that if a cedar or a cypress lose its central terminal branch, it will never become a handsome tree unless the cultivator can find a branch so situated as to take the place of the regular one—a matter sufficiently difficult. A plant raised from the seed is a distinct individual, has its own proper centre, and will grow accordingly; whereas all plants raised from cuttings, layers, or suckers, are merely extensions of some pre-existing individual, and consequently their growth is more or less modified.

WATER.—*A copious supply of water* is essential to a good

kitchen garden. Many crops are lost, or produced of very inferior quality, for want of watering. Lettuces and cabbages are often hard and stringy, turnips and radishes do not swell, onions decay, cauliflowers die off, and in general, in dry seasons, all the *cruciferea* become stinted, or covered with insects, even in rich deep soils. Copious waterings in the evenings, during the dry seasons, would produce that fulness and succulency which we find in the vegetables produced in the low countries, and in the Marsh Gardens at Paris; and in this country at the beginning and latter end of the season.

The watering the foliage of fruit and other trees to destroy or prevent the increase of insects, and of strawberries and other fruit shrubs to swell the fruit, is also of great importance.

When convenient, gardens should be near a river or brook, that they may be well supplied with water. From these, Forsyth observes, "if the garden does not lie too high the water may be conducted to it by drains: or which is much better, by pipes, taking care to lay them low enough to receive the water in the driest season, which is the time when it will be most wanted.—If there be no running water near the garden, and if the latter lies on a declivity near a public road, I would advise to make a hollow drain, or a cut, from the most convenient part of the road to receive the water that washes the road in rainy weather, and convey it to a large cistern, or tank, in the upper part of the garden; this, if the road be mended with limestone or chalk, will prove an excellent manure. The water from the cistern, or from the river, may be conducted to the different compartments by means of pipes, which, having cocks at proper places, the water may be turned upon the different compartments of the garden at pleasure. Or the water may be conveyed in proper channels, and turned on the compartments in the same manner as in watering meadows. These pipes, channels, &c. will be a considerable expense at first; but they will soon repay it, by saving a great deal of time, which would otherwise be spent in pumping and carrying water. The most convenient time for turning the water on, is, in general, during the night; and in dry weather it would then be of the most essential service. If the situation be such that you are obliged to pump the water from deep wells, there should be a large reservoir, in which it should be exposed to the sun and air, for some days before it is used; it may then be turned on as above. If the ground be wet and spewy, it will be proper to make a basin of the most convenient place to receive the water that comes from the drains, and to collect the rain that falls on the walks.

A source of water is considered essential to a garden by most writers. Loudon and Wise, Evelyn, Hitt, and Lawrence, are

warm in recommending it. M'Phail observes, that a garden, to bring the produce of the soil to the greatest perfection, "should be well supplied with water, to water the plants in dry seasons." Marshall says, "if water can be introduced, and kept clean with verdant banks around it, it would be very useful where a garden is large; but let it be as near the centre as possible, being the most convenient situation. It should be fed from a Spring, and (if it could) be made to drip in the reservoir, because its trickling noise is agreeable music in a garden to most ears." "If there be no natural stream that can be conducted through a garden," observes Nicol, "water should be conveyed from the nearest river, or lake, or pond; soft water being most desirable for the use of the garden."

General Rules for Cultivation.—Among the general rules which ought to be regarded in the management of a garden, and which in some measure apply to the management of a farm, we may particularize the following:

A garden should be inclosed by a secure fence—otherwise an unruly animal may destroy in a night the fruits of many a day's toil.

A garden should be rich: for here the maxim particularly applies,—that it is better to cultivate a small piece of ground well, than a large one slovenly and bad. "*Well* done" is the only "*good enough*" for a garden.

Do not plant your roots and vines in the shade, or under the drippings of trees, but in an open exposure. Appropriate these situations to medicinal plants and herbs. Trees impoverish the ground, and their shade is baleful to most crops. Plant trees upon the north, east, and west borders, where their shade will be but partially prejudicial, or along a main alley.

Alternate your crops; that is, do not plant your onions or other vegetables two successive years on the same quarter.—This rule is as important to the garden as it is to the farm; and every farmer, at least every good farmer, knows, that alternating his farm crops is of the first importance to profit.

Plant your seeds when the ground is fresh dug or ploughed, when it is filled with atmospheric air, and moist, and permeable to heat, three indispensable requisites to the vigorous germination of the seeds. They will then sprout quick, and grow luxuriantly.

Seeds require to be kept moist till their roots have got firm hold of the earth, and their leaves have expanded above it. To ensure this, the soil must be brought in close contact with them, and they sufficiently covered. A good precaution is to tread the fresh dug soil on the line where the seeds are to be planted, which retards evaporation from below; or, when the seeds are

covered to a sufficient depth, to compress the earth upon them with a hoe, spade, or board, which not only tends to retain the moisture, but to break the soil and to bring it in close contact with them. Seeds often fail to grow, or, having began to germinate, are dried and lost, for the want of moisture. And many small seeds with husky coverings, particularly flower seeds, have been declared bad, because they have been planted without due reference to this rule.

As soon as the plants are firmly rooted, the more the earth is stirred about them the better. This facilitates the preparation of the vegetable food in the soil, and greatly promotes growth.—Next to the destruction of weeds, nothing counteracts the effects of drought so much, in garden or field, as stirring the surface of the soil.

Different seeds require different temperatures to induce germination; and if they are put into the ground when it is too cold, they are liable to rot. Wheat, rye, barley, &c. will germinate at 45 degrees, corn at perhaps 55, while the melon probably requires a heat of 60 to 70 degrees. The common bean will vegetate in a cold temperature, while the Lima bean will rot in a cold or wet soil. Hence, in planting, regard is to be had to the hardiness of the plant which is to be sown.

HOT-BEDS.—In this latitude a hot-bed is almost indispensable with those who would have good gardens. There are many plants cultivated in gardens, which, in order to receive the greatest benefit from them, require a little forcing, by which they are brought to greater perfection than they would arrive at if planted in the open ground.

Early cabbages should be brought forward in this manner, as by it they may be brought to the table one month sooner than when the seed is sown in open ground.

Tomatoes and peppers are more productive when brought forward in beds; besides, to have tomatoes during Mid-Summer, not only pleases the appetite, but is conducive to health.

Cucumbers, melons, and squashes may be started in hot-beds, and afterwards transplanted to the open ground with advantage, as some of the finest varieties of melons do not ripen sufficiently early to have them in perfection, unless they are brought forward in this manner.

We would not recommend planting hot-beds in this vicinity until the middle of March; but the manure for them should be collected and put in a heap, that the fermentation may commence before it is put into the bed, otherwise they are liable to become so hot as to destroy the young plants.

Hot-beds are composed of fresh horse, cattle, or sheep dung.

They may also be made of tanner's bark. But the best material is dung from the stable, taken away before it has rotted, short and long promiscuously, but rather long than short. If there is a large proportion of short, it may have any litter added to it; any broken straw, hay, or corn stalks, in order to make a due mixture of long and short. Let this be deposited somewhere near where you are going to make your bed. When your materials are collected, then begin to make a new heap, on one side, taking the stuff by fork-fulls, and shaking and mixing it well together, the long with the short, and thus go on, till you have the whole in a round heap rising to a point.

The second day after this heap is made, it will begin to send forth steam. Let it remain three days in this state, that is to say, four clear days, after the day of making the heap. Then turn the heap back again; shaking all well to pieces, as before, and bring to the inside that part of the heap which was before on the outside. Let it remain now three clear days, after the day of turning. Then turn it again; shaking it well to pieces as before, and bring again the outside to the inside. When it has remained two clear days in this state, it is fit to make the bed with.

In the matter of making the bed, it should be so contrived as to face the south. The first thing to be done is to make a frame of wood work, on which the lights or glasses are to be laid.—Let this be eighteen inches deep at the back, and nine inches deep at the front; this is to give it a slope. The frame may be of such dimensions as are convenient for the lights, say four feet wide and nine feet long, which will admit of lights 3 feet by 4, laid the long way of the lights, the cross way of the frame.

Having placed the frame on the ground where you mean to make your bed, with a pointed stick mark the ground all around the outside of the frame, and then remove the frame. Then take some sharp pointed straight stakes, and drive them in the ground at each corner of the place marked out for the bed, and one or two on the back and on the front side. Let them be about four feet high. As these are to be the guides in building the bed, they ought to be very straight and placed perfectly upright.—Each stake may be placed about an inch further out than the mark on the ground, for fear of having the bed too narrow; though observe the bed should be as near the same length and breadth as the frame as it is possible to make it.

In order to begin the work well, it is a very good way to put some boards on their edges, on the ground, at the ends and sides on the inside of the stakes, so as to have a sort of open box to begin to make the bed in.

Things being thus prepared, you begin taking the dung on the side of your heap, nearest to the spot where you are building

the bed. Keep taking up clean to the ground. In this operation use a shovel as well as a fork. Take long and short dung fairly, and mix them well as you put them in. Shake the stuff in such way as not to have any lumps. Let the bed rise in all parts as evenly as possible—that is to say, do not put much in one part at a time. Beat the whole down with the fork, as you proceed. When you have shaken on dung to the thickness of four or five inches, beat all over well again, and so on until the work is finished. Remember to keep the edges of the bed well beaten, or else they will be more hollow and sink more than the rest, and then the earth on the bed will crack in the middle. Beat them well, and keep them well up as you proceed. Beat well the sides of the bed as it goes on rising, occasionally combing them down with the prongs of the fork; in short, make the sides as upright and smooth as possible. As you proceed, measure the height frequently in the different parts of the bed, to see that you are keeping the height every where the same. At last, shovel and sweep up all the earthy stuff around the bed and where your dung heap was, and lay it very smoothly on the top of the bed, and make all smooth and level with the back of your shovel.

The bed is now made. Put on the frame, and fix the lights on. In about twelve hours the heat will begin to rise, and in about forty-eight hours the heat will be up. Ascertain, by running your finger in the middle of the bed as deep as you can, the degree of heat. If this be so great as to burn your finger—that is, if you cannot bear it, then it is too hot to receive the earth; but if not, put on the earth all over the bed. If the heat be too great, give the bed some air, and wait till a little of the heat has gone off.

The earth should be moderately dry, but neither dusty nor wet. The bed is to be covered all over about six inches deep. When the earth has been on twenty-four hours, take off the lights, and stir the earth well with your hands, for hands are the only tools used in a hot-bed. When you have stirred the earth well, and made it level and smooth, you may sow your seed, if you do not find the earth too hot. But observe, the earth is to be level, and not sloping like your glass. The glass is sloping to meet the sun and turn off the wet; but the earth must be perfectly level.

When you have taken off the lights, make little drills with your fingers from the back of the bed to the front, half an inch deep, and about an inch apart. Make them equi-distant, parallel, and straight. Then drop in your seeds along the drills, rather thin; but as some will not grow, and others may be pulled up if too thick, it is better to have too many than too few. When

you have dropped in your seed all over the bed, and distinguished the several sorts by names or numbers, written on bits of paper and put into the cleft of a little stick, stuck in the ground, then cover them all over neatly and smoothly, and put on the lights.

In the management of the hot-bed, it is important always to give as much air as the plants will endure. It is an error to endeavour to obtain, by exclusion of air, something to make up for the want of bottom heat. Nature gives air as well as heat. The hot-bed, when made as above, will be about four feet high when finished. It will sink as it heats, and at last come to about one foot and a half high. The heat will gradually diminish, but it will be a great heat for about six weeks, and some heat for four months. It is this bottom heat that makes things grow. The sun is often hot in April; but it is not till the earth is warm, that vegetation advances with rapidity.

If the weather be not very cold indeed, air should be given to the bed every day, even before the seeds begin to appear. This is usually done by inserting little wedges under the edges of the lights, and raising them; or if the weather will allow, by shoving them up or down, or even taking them off.

The heat under the glasses should not in general exceed seventy-five degrees in the day-time, and sixty at night.

It will be necessary to water. Take out a light at a time, and water with a watering pot that does not pour out heavily. Water about sun-set, and then shut down the lights: the heat will then rise, and make the plants grow prodigiously.

As soon as the plants are fairly up, thin them properly, and stir the ground about at the same time with your finger. But the important point in the management of the hot-bed, is to give plenty of air.

If the bed is made in an open place, some precaution will be necessary with regard to shelter. While the dung is working before it is made into the bed, in case of very sharp frost it must be covered, especially on the north and north-west sides. If it be not, it will freeze on these sides, and of course will not ferment. This may be done by throwing on a parcel of straw or stalks, taking them off again when the frost relaxes. After the bed is made, some stakes may be driven down at the distance of four feet, on the north side and west end. Fasten a pole from stake to stake, and place along against them some sheaves of straw. If necessary, some might also be laid against the bed itself.

When the plants raised in this manner have acquired a sufficient size, (say about the middle of April, but of this each one will judge according to circumstances,) they are to be set out in the open ground, in the usual way of transplanting.

Hot-beds made with tanners' bark, afford a more equal warmth than horse dung. The method of making them is thus: a trench is dug about three feet deep, if the ground be dry; but if the soil be wet, it ought not to exceed the depth of a foot, and the bed should be raised two feet above the ground. Their size must be in proportion to the frames intended to cover them, though they ought to extend at least ten or twelve feet in length. The trench should be lined with bricks on each side, to the height of three feet, and filled in the Spring with fresh tanners' bark, which should previously be thrown up into a round heap, in order to drain for three or four days. When the tan is laid in, it ought to be gently beaten down with a dung fork; for if it be trodden in it will be prevented from heating, as it settles too close. The frame and glasses are now to be fixed, and in the course of ten days or a fortnight the bed will grow hot, when pots of plants or seed may be plunged in it, care being taken that the bark be not compressed. These beds will preserve a proper temperature of heat for three or four months, which may be continued two or three months longer by adding a load or two of fresh bark, as often as the warmth begins to decrease.

Artichoke.—The artichoke of the garden, is a different thing from the Jerusalem artichoke. In look it very much resembles a thistle of the big blossomed kind; it sends up a seed stalk, and blows like the thistle. The parts that are eaten are the lower end of the thick leaves that envelope the seed, and the bottom out of which these leaves immediately grow. The whole of the head before the bloom begins to appear, is boiled, the pod leaves are pulled off by the eater, one or two at a time, and dipped in butter, with a little pepper and salt, the mealy part is stripped off by the teeth, and the rest of the leaf put aside, as we do the stem of asparagus. The bottom, when all the leaves are thus disposed of, is eaten with a knife and fork.

Artichokes are propagated from seed or from offsets. If by the former, sow the seed in rows a foot apart, as soon as the frost is out of the ground. Thin the plants to a foot apart, in the row; and in the Fall of the year, put out the plants in clumps of four, in rows three feet apart, and the rows six feet asunder.—They will produce their fruit the next year. When Winter approaches earth the roots up well; and before the frost sets in cover all well over with litter from the yard or stable. Open it at the breaking up of the frost; dig all the ground well between the rows; level the earth down from the plants. You will find many young ones or offsets growing out from the sides. Pull these off, and if you want a new plantation put them out as you did the original plants. They will bear, though later than the

old ones, that same year. As to sorts of this plant, there are two, but they contain no difference of any consequence; one has its head or fruit pod round, and the other rather conical.

Asparagus.—To make a bed of this excellent Spring green, open a trench, three or four feet wide, and about a foot in depth, and fill it about half full of a compost, which may be one half of good dung, and the other half of the richest black mellow earth, the whole well mixed together; lay a thin layer of such earth over this, and then lay on the roots, in their natural position, eight or nine inches apart: or if seeds are to be used, put them about half this distance from each other; fill up the trench with the richest earth taken out, and the bed is completed. If roots are planted, the shoots may be cut the second year; if seeds, not till the third. All the shoots which come up after about the middle of June in northerly climates, but sooner than this in those more southerly, should be suffered to grow up; otherwise the roots will soon become weakened for want of the nourishment necessary for the plants to be derived from the air. Cutting off all the shoots, as they rise during the season, will soon kill the roots.

In cutting asparagus, slip the knife down almost perpendicularly close to the shoot, and cut off slantingly a few inches within the ground, taking care not to wound the successional buds advancing from the same root.

When the tops are killed by the Fall frosts, they should be cleared off, and a layer of rotten dung, or such compost as forms the substratum of the bed, should be laid over it. Weeds should not be suffered to grow on the bed. As it rises in height by these accumulations of manure, let a part of it be pared off early in the Spring, before the young shoots are in the way, and let some fresh compost then be laid on, and the surface raked.

It is advisable to have two beds of this plant: the one so situated as to come on as early as possible, the other late. The warmest situation is necessary for the former; for the latter the coolest, or what is shaded; for this plant will grow large and tender in a shaded place, but its vegetation will be considerably later. Another method of delaying the shooting of the plants is to shade the bed in the Spring, before the shoots are in the way, but not so deep as to injure the roots.

Asparagus is a valuable and profitable plant for cultivation, as it is perhaps the finest tasted early vegetable that we have. It is raised with but little expense, and, if properly cultivated, is very productive. The beds require to be renewed, however, after a number of years; but it is believed that the term of their duration will be found to depend much on the sort of manure

used for the substratum. It has been common to use barn dung entirely for this purpose; but this manure, it is well known, will in a few years moulder away almost to nothing. An extensive cultivator of the plant near Philadelphia, makes use of river mud as the principal ingredient in forming the bottoms of the beds; and this, or something similar, ought to be preferred, as being calculated to form a much more durable nourishment for the plants than barn dung, or other manures which are soon dissipated. We would therefore recommend some rich earth, similar to river mud, where this cannot be had, with a suitable mixture of good dung, as the most proper ingredients for forming the bottom of the beds. The seeds of the plant are easily preserved by cutting the stalks, when the berries containing the seeds are ripe, and hanging the stalks up to dry.

To force Asparagus.—As soon as the frost is out of the ground, let a very moderate hot-bed be made, of any convenient size, with hot horse manure; the frame being placed on it in the usual manner, cover the bed three inches thick with earth, whereon the asparagus roots are to be placed, taken from an old bed, or nursery rows three or four years old. The roots will require no trimming, but merely placed as thick as possible in the bed, so that the crowns are not to be placed in one another. This done, they are to be covered three inches with light soil or tanner's bark, when the sashes may be closed to draw the heat; but care must be taken not to let the lights remain on a day after the heat begins to rise, when six or eight inches more of light earth may be covered over the bed. The treatment is simply to give plenty of air in the day, and moderately covering the frame at night; to keep out the frost is sufficient. After the bed has been planted ten or twelve days, the roots will begin to vegetate, when a good watering is to be given every other day; and in three weeks after the time of planting, a good supply of asparagus will appear, and continue if properly managed from ten to twelve days.

"Asparagus in its native state is so dwarfish in appearance even when in flower, that none but a botanist would consider it as the same species with our cultivated plant." From this we may discover the great benefits of high culture. Some gardeners recommend the beds to be dug one foot deep; but the Edinburgh Encyclopædist, from whom we have made the above extract, says "the soil should *not be less than two feet and a half deep*;" and he adds, "it can scarcely be too well dunged."

The soil (or subsoil) should undoubtedly be loose; and the Encyclopedist recommends a rich sandy loam. The finest asparagus that we have ever seen, however, grew in gravelly ground, cultivated by the late Comfort Tyler, at Montezuma. It is high-

ly probable that the soil is impregnated with salt. The use of this mineral as a manure for this plant is well known to many gardeners; and we are satisfied of its value from our own experience. We think neither cows nor sheep require this stimulant more than asparagus. *Deane* says, "To a bed fifty feet by six, *a bushel of salt* may be safely applied before the plants start in the Spring." We often apply it long after they have started.

The same Encyclopædist says, "damp ground or wet sub-soil is not fit for asparagus. Indeed, the French consider wetness so prejudicial to this plant, they raise their asparagus beds about one foot above the alleys in order to throw off the rain.

Gray, an English botanist, says, "The plants are most diœcious;" and Weston in "the Repertory of Arts," observes that the males yield a greater number of shoots than the females.—He advises, in planting out beds, to select the former; and to prevent mistakes, says they should not be taken from the seed bed till they have flowered.

Asparagus "is found on the sea shores in many parts of Europe; and is abundant in the inland sandy plains in Russia, Turkey, and Greece. It was in much esteem both among the Greeks and Romans. It was much praised by Cato and Columella; and Pliny mentions a sort which grew near Ravenna, a deep sandy country, three shoots of which would weigh a pound." —Loudon's Encyc. Plants.

Many gardens in the Genesee country, says the Genesee Farmer, have been laid out on heavy loam; and for asparagus beds we would advise the proprietors to prepare an artificial soil. We have lately seen a bed for this purpose which is two feet and a half deep.

THE BEAN.—The species of bean most cultivated in this country, is the kidney bean, of which there is almost an endless variety. Some are dwarfs, and some climbers; but the mode of propagating and cultivating is nearly the same in all, except that the dwarfs require smaller distances than the climbers, and that the latter are grown with poles, which the former are not. They all require a strong, substantial, moist soil, well dug and manured; and the enemies they most dread are late and frosty Springs, and early and hot Summers. We must therefore regulate our labours here according to circumstances.

When your ground is well prepared by digging and thoroughly manuring, plant dwarf beans in rows at the distance of two or three inches from each other, and the rows two and a half feet apart. Squares of these may be planted from April to August, to afford a succession of crops, according to the taste and convenience of the cultivator. Climbers, or pole beans, should be

planted in groups, four or five together, with a pole well fixed in the earth for them to mount upon; the distance between the groups may be four or five feet. Of the dwarf sorts we may reckon, the dun or drab coloured, the yellow, the black, the speckled, the painted white and red. Among the runners or pole beans, there is the white, the case-knife, the cranberry, and the Lima bean. This last is never eaten green (that is, the pod is never eaten); it is sometimes called the butter bean, and has a broad, flat, and thin seed, of a yellowish white colour. This bean should not be sown until the ground is quite warm. When the beans begin to run they should be trained to mount the poles, for it is only by so doing that they will receive that degree of air and sunshine, which is necessary to the production and perfection of their fruit.

When the bean plants have attained the height of three or four inches, the earth about their roots should be loosened with the hoe, and a fresh portion of it drawn up to the stem. Hoe again when the flowers begin to show themselves, and a third time about a month after the second hoeing. But perhaps the better practice is, to take as our guide on this subject, not the condition of the plant, but that of the soil and weather; and whenever the latter is dry and hot, or the former hard, or baked, or infested with worms, repeat the hoeing—remembering that it is not easy to commit any excess in this way, and in general, that the oftener the work is repeated (unless the weather be wet) the finer and more abundant will be the crop.

When the bean is sufficiently in blossom (which is taken for granted when the lower or first-formed pods begin to swell), it is a practice not uncommon to pinch off the tops of the vines—the object of which is to prevent the plant from having more pods than it can bring to perfection, and to render better those which are left, by giving to them a nutriment which would have otherwise gone to the support of a useless portion of stem. But of this practice, and of the theory on which it is founded, there is some doubt, because it does not appear to follow, that when the growth of a plant is checked or suspended in one direction, it will not exert itself in another as injuriously to the crop as any increased length of stem would have done.

The Beet.—There are yellow and white beets, as well as red; but the red is the true kind, the others being degenerate. The cultivation of the beet, whatever be its species or variety, is the same. As soon in the Spring as the ground is free from frost, and dry, prepare your ground by a thorough digging. It should be a rich, loose, and deep soil, which has been well manured the preceding Fall. Beets are planted in rows, the rows

about a foot asunder, and the beets when thinned out, about eight inches apart. Make your drills about an inch and a half deep. Drop the seeds thinly into them, and draw over them a light covering of the surface soil, trodden down with the foot.

As the beet is easily affected by frost, the planting of the main crop should be delayed till about the middle of May. As soon as the plants have come up and put out three or four leaves, thin the rows, so as to leave the plants about eight inches apart, some say twelve or fourteen; and if there be any chasm, fill up these with the plants you pull out. The intervals between the rows should at the same time be thoroughly cleansed from weeds, and the oftener this operation is performed, and the ground stirred, during the whole course of vegetation, the better. It will make the product of a larger and better quality. In dry weather, and while the plant is young, they will require watering. Transplanted beets are not as good as those managed as above.

To preserve beets during the Winter, put them in a dry cellar, with dry sand between them, taking care to expose them a day previous to the air, to carry off the moisture. In quantities, they may be preserved out of doors as follows: Take them up three weeks before the hard frost usually comes; cut off their leaves; let them lay two or three days upon straw or boards to dry in the sun; then lay a little straw upon the ground, and in a fine dry day place ten bushels of beets (taking out all the cut or bruised ones) upon it in a conical form. Put a little straw smoothly over the heap; then cover the whole with six or eight inches of earth, and place a green turf on the top to prevent the earth from being washed by rain from the point, before the frost sets in. The whole heap will freeze during the Winter, but the frost will not injure the beets, nor will it injure carrots preserved in the same way. If you have more than ten bushels, make another heap or heaps, for fear of heating, before the frost comes; for when the frost comes, all will be safe till Spring.

A few of the largest and finest should be kept for seed.—Twenty of them set out in the Spring, and occasionally laboured, will give you nearly a bushel of seed.

THE CABBAGE.—The soil best suited to cabbages, is a strong, rich, substantial one, inclining rather to clay than to sand; but they will grow in any soil, if it be well worked and abundantly manured with well rotted dung. Cabbages are raised either from plants taken from the hot-bed, or from seed in the open ground.

If the seed of the earlier sorts has been sown in a hot-bed, they will, when two or three inches high, be ready for removal.

In this case, as soon as the season will allow prepare a bed, by digging out the ground a foot deep, four feet wide, and to as great a length as is required by your number of plants. Fill this up with good dung, cover it over with four inches of good earth, and set your plants upon it in rows, four inches apart, and two inches apart in the row. When you have put out the plants, water them lightly, and shade them for two or three days from the sun. They must also be sheltered every night, which may be done in this manner: take some rods, put one end of each rod into the ground on one side of the bed, and the other end on the other side; put these rods at about two feet asunder all along the bed; then tie some rods long ways to these arched rods, so that when you have done your bed has an arch over it formed by these rods. Every evening about sun-set, cover this arch with mats, old carpets, or with a light covering of any sort, which take off again at sun-rise in the morning.

To put out all your plants in this way, will require a very long bed. If therefore your number of plants be very large, the best way will be to put out a part of them in this way, leave the remainder in the hot-bed a week longer (taking off the lights in the day time), and then to plant all the remainder out in beds of fine rich earth, in the natural ground, and without any covering. Here they are to remain until transferred to their permanent beds, which they should be in fifteen or twenty days.

In the open ground, put your seed rows at six inches distance, and put the seeds thin in the row. As soon as they are up, thin the plants to three inches in the row. When two or three inches high they should be taken from the seed bed, and put into fresh dug, well broken ground, at six inches apart every way. This is called pricking out. By standing here fifteen or twenty days, they get straight and strong, stand erect, and have a straight and stout stem.

If you do not intend to prick out, leave the plants thinner in the seed bed, and hoe deep between them while they stand there. And when you come to plant out, if you do not want them all, choose the strongest for that purpose; and at any rate, do not plant the strong and weak promiscuously, but put each by themselves.

The act of transplanting should be carefully performed, and in moist weather. Holes of sufficient depth and width should be made, for the smaller sort of cabbages at the distance of two feet and a half, and for the larger sorts three feet every way. In these the plants should be placed up to their lower leaves, and the earth brought closely about the roots, which is best done by pushing down the dibbler at a small angle with the plant, and then bringing it up to it with a jerk, thus pressing the earth

against the point or bottom of the root. It is of great importance to have the earth well pressed against the point of the root; for if the fibres do not touch the earth closely, the plant will not thrive. Should it be necessary to perform the operation of transplanting in dry weather, the plants should be watered once a day.

Where their distances will allow, you should once or twice during their growth dig between the cabbages. To prevent a sudden check by breaking all the roots at once, in hot weather dig every other interval, and leave the rest, and dig them a week later. All the larger sorts of cabbages should, about the time that their heads are beginning to form, be earthed up, that is, have the earth from the surface drawn up against the stem; and the taller the plants are the more necessary it is, and the higher should the earth be drawn. After the earth has been thus drawn up from the surface, dig or hoe deep the rest of the ground.

As to sorts, the earliest is the Early Dwarf, then the Early Sea Green, then the Early York; perhaps any one of them will do, but the first will head ten days earlier than the last. The *Sugar Loaf*, the sweetest and richest of all cabbages, if sown and transplanted when Early Yorks are, will head nearly a month later. It is an excellent cabbage to come in in July and August. For Winter use, nothing is better than the *Dwarf Green Savoy*. For *Drum Heads* or other large cabbages, the time of sowing and transplanting is the same as for Savoy. The *Red Cabbage* is raised and cultivated, in the same manner and in the same season as the *Green Savoy*. There are many other sorts, early and late.

Various expedients have been adopted for preserving cabbages through the Winter; and some have a preference for one way, and some for another. The following has been found not only to be the surest, but the least troublesome of any. Lay out a piece of ground four feet wide, and in length proportioned to the quantity of cabbages to be preserved. Dig on each side of it a little trench, a foot deep, and throw the earth up on the four feet bed. Make the top of the bed level and smooth. Lay some poles or old rails, at a foot apart, long ways upon the bed.—Then put some smaller poles on stout sticks, cross ways on the rails or poles, and put these last at five or six inches apart. Upon these lay corn stalks, or twigs, or brush of trees, not very thick, but sufficiently thick just to cover all over. Make the top flat and smooth. Then just as the frost is about to set in, take up the cabbages, knock all dirt out of their roots, take off all dead or yellow looking leaves, and some of the outside leaves besides; put the cabbage head downwards upon the bed, with their roots sticking up, and cover them with straw so thick as for

the straw to come up nearly to the root of the cabbage. Do not pack them quite close, it is better if they do not touch each other much. Lay some pieces of wood or brush wood to prevent the straw from blowing off. If the frost comes on before you have got the cabbages up, cut them off close to the ground, and let the stumps instead of the roots, stick up through the straw. Out of this stack you will take your cabbages perfectly *green* and *good* in the Spring, when the frost breaks up; and to this stack you can at all times in the Winter go, with the greatest facility, and get your cabbages for use. The hollow part below the cabbages takes away all the wet that may come from occasional rains or meltings of snow; and the little ditches on the sides of the bed, keep the bed itself free from being soaked with wet.

The stalks of cabbages are to be preserved, for they are very useful in the Spring. Take up the stumps from which you have been cutting cabbages, before the frost sets in. Trim off the long roots, and lay the stumps in the ground, in a sloping direction, row behind row, with their heads four or five inches out of the ground. When the frost has set in in earnest, and not before, cover the stumps all over, a foot thick or more, with straw, with corn stalks, or with evergreen boughs of some sort. As soon as the frost breaks up, take off the covering, and stir the ground (as soon as dry) by hoeing among the stumps. They should be placed in an early spot, in one of the warmest places you have, and they will give you an abundance of fine early greens.

A few of the best plants of each variety should be kept for seed; and in setting them out, care must be taken to keep them as far apart as possible. The root should be kept in the ground all Winter, therefore the cellar or some secure place out of doors should be selected.

Brocoli.—Brocoli in all its varieties is only a late heading cauliflower. It is of two kinds, *purple* and *white*. It is cultivated in all respects like a cabbage; but as it is large, it must be placed at distances not less than two feet and a half each way. If raised very early in the Spring and planted out in June, and in good ground, as cool as can be got, it will have heads in October; and if any of the plants have not then perfected their heads, when the hard frost is coming, they may be treated like those of the Spring sown cauliflower which have not perfected their heads at this season. The white sort is deemed the handsomest, but the others are more hardy. They should be planted in the south border, in order to be kept as cool as possible.

Cauliflower.—This is a cabbage, and the French call it the flower cabbage. Its head is a lump of rich pulp, instead of being, as a cabbage head is, a parcel of leaves folding in towards

the centre, and lapping over each other. The cauliflower is an annual plant. It blows and ripens its seeds during the year that it is sown, and, in fact, the part which is eaten is not, as in the cabbage, a lump of leaves, but the seed stalks, pods, and blossoms, in their embryo and compact state, before they expand.—They are sown and treated in the same way as early cabbages. They will begin to come early in October; and if any of them have not perfected their heads when the sharp frosts come, take them up by the roots, hang them up by the heels in a warm part of the barn or in a cellar; they will get tolerable good heads, and you will have some of them to eat at Christmas.

Cale.—This is of the cabbage kind. There are several sorts of it; and it is in all respects cultivated like the *Green Savoy.*—The cale does not head, but sends forth a loose, open top, which in England is used after the frost has pinched it, and then it sends out side shoots from its tall stem, which it continues to do, if kept cropped, till May.

Cale (Sea).—This is a vegetable little inferior to asparagus. It is propagated by seeds and by offsets. The seed may be sown, or the young plants at a year old planted, or the offsets or little shoots from the sides of the stems, planted on the spot where the crop is to be produced. The mode of cultivation is in beds, precisely the same in all respects as asparagus; except that the cale may be begun upon the second year. Cover the beds thick with litter in the Winter, so that the frost may not enter very deep, and early in the Spring you will have plenty. It is cut the moment the sprout makes its appearance. And you have a white stalk seven or eight inches long, which is cooked just as asparagus is, and is all eaten.

This plant is a native of the sea beach, and is as hardy as any plant that grows. Instead of earth, you may if convenient, lay sand, especially sea sand, for it to shoot up through. It may be moved at any age of the plant, and any old stump of it will grow. After you leave off cutting it in the Spring, it goes shooting on, and during the Summer it bears seed.

In the Fall the stalks are cut down, and you proceed with the bed, as with that of asparagus.

Capsicum (Peppers).—Sow early in fine earth, in drills a foot apart, and at six inches apart in the rows.

The Cardoon.—This plant is a species of the cynara or artichoke; the stalks are used when well blanched for salads, soups, and for stewing.

The stalks of the leaves being thick, fleshy, and crisp, are the

eatable parts, being first blanched by earthing them up like celery two or three feet high, to render them white, tender, and of an agreeable flavour, otherwise they will be rank and bitter. They are in perfection in Autumn and Winter.

There are several sorts of this plant. The common, the Spanish, cardoon of Tours, and red cardoon. The Spanish is considered the best. Sow about the middle of April in deep, light, and not over rich soil, in trenches about six inches deep, twelve inches wide, and four feet distant from centre to centre. Drop three or four seeds together at intervals of eighteen inches, and when they come up thin them out to single plants. Water frequently during Summer; and in a dry day about the end of October, commence the operation of blanching, by tying up the leaves with twisted hay-bands, after which earth may or may not be heaped around them, in the manner of earthing celery, according as they are to be used early or during Winter. The common practice is to tie slightly with matting, in the beginning of October, and earth up once a fortnight till the plants are sufficiently covered in the manner of celery. The French mould up the bottom of the plant a little, then tie up the leaves with packthread, and thatch them with long clean straw, made fast with strong matting or small ropes. The hay-band method is best.

Cardoons may be transplanted in the manner of celery, but they are found to do much better when sown where they are to remain. In France, the flowers are gathered and dried in the shade, and used instead of rennet to coagulate milk.

The Carrot.—We have already treated of the carrot as a field culture. In the kitchen garden, it is managed in all respects like the beet. A few of the roots put out in the Spring, will give abundance of seed. The mark of a good kind of seed, is, deep red colour of the tap. The paler ones are considered degenerate; and the yellow ones are fast going back to the wild carrot.

Celery.—There are three or four sorts of celery. The white, red, the hollow, and the solid. The hollow white is considered the best; but the propagation and cultivation of all are the same. Sown in the Spring and in the open air, the seeds will be very slow in coming up, so that to have early plants we must have recourse to the hot-bed, or to some other means of procuring the plants. A couple of flower pots of the larger size, filled with good soil and kept in a room moderately warmed during cold weather, will answer the purpose very well. If the apartment has a window of southern or eastern aspect, let the pots be placed before it, so as to give them light and air, as well as heat.—

23

With the aid of water a little warmed, the seeds sown in the pots will show themselves in a fortnight, and in four weeks more will be fit to set out in the garden.

As soon as the plants are three inches high, prepare a bed in the garden of very fine rich earth. There prick out the plants at four inches apart, and of course nine in a square foot. As the plants are small this must be done very carefully, and they should be gently watered and shaded for two or three days. In this bed the plants are to stand till the middle of July or thereabouts, when they are to go into the trenches. Make the trenches from east to west, a foot deep and a foot wide, and put them not less than five feet apart. The ground that you make your trenches in should not be fresh dug, but be in a solid state.—Lay the earth that you take out in the middle of the space between the trenches, so that it may not be washed into them by heavy rains, for it will then cover the plants and injure them.—When you have made your trench, put along it some good compost manure, partly consisting of wood ashes. No dung, at least not fresh dung, must be used, for this will make the celery rank. Dig this manure in and make the earth fine as you go.—Then take up your plants, and trim off all the long roots. You will find that every plant has offsets to it, coming up by the side of the main stem: pull all these off, and leave only the single stem. Cut the leaves off so as to leave the whole plant about six inches long. Plant them six inches apart, and fix them well in the earth, as before directed with regard to cabbages. Do not water the plants; and if you plant in fresh dug ground, and fix your plants well, it will not be necessary to shade them.—When the plants begin to grow, which they will soon do, hoe on each side and between them with a small hoe. As they grow up earth their stems, that is, put the earth up to them, but not too much at a time; and let the earth that you put up be finely broken, and not at all cloddy. While you do this, keep the stalks of the outside leaves close up to prevent the earth from getting between the stems. The object of earthing up is to change the colour of the plant from green to white, and to render it more tender, sweet, and esculent. In earthing, take the earth continually from time to time from the sides of the trenches, and proceed in this way till you come to the earth originally dug out of the trenches, and by this time the earth against the plants will be above the level of the ground. Then you take the earth from the middle, where it was originally thrown out, till at length the earth against the plants form a ridge, and the middle of each interval a sort of gutter. Earth up very often, but not much at a time: every week a little. In October, the plant will probably be fit for use.

It is preserved for Winter use, in sand in the barn or cellar, taking care not to cover the points of the leaves: or the plants may be covered where they grow, with boards and stable litter. Those preserved in the latter way, are most suitable for seed.—A single plant set out in the Spring will afford abundance.

Chicory (*Endive*).—This is a salad plant, of which there are two sorts—the *curled* and the *plain*. The first has the finest appearance, but the last is the best for use. A light, fresh, and moist loam, is the soil most favourable to this plant, as in stiff clays and poor sands it is tough and bitter. It is sown in drills a foot apart; when the plant comes up, thin them to a foot apart in the row. The ground should be frequently hoed, and kept clean between the plants. Before it is used as a salad, chicory undergoes a process called bleaching, for while green it is bitter and not very crisp. To bleach them, when the weather is quite dry, and the plants have attained a good size, gather all the leaves carefully up with your hands into a conical form, and tie them round with matting or soft string. When they have remained in this state, about a fortnight, they will be fit for use. Some give them two tyings, one near the root of the leaves, the other near the tops or points, at an interval of a few days from each other.

If chicory is transplanted, this should be done when the plant has ten leaves on, or when it has attained the height of two or three inches, and set as before directed. Let the plants be well set, and shaded during the day for a day or two, and watered morning and evening.

The time of sowing for the Spring will be as soon as the weather will permit; for the Winter, about the end of July or the beginning of August. Before the frost sets in they must be tied up in a conical form, as before directed, and all dead or yellow leaves taken off. Then dig them up with a ball of earth to each, and put them into light earth in a cellar or some warm building. Put only the roots in the earth, and do not suffer the plants to touch each other. Pour a little water round the roots after you have put them in the earth. If they are perfectly dry when tied up, they will keep till Spring.

One of these plants kept in the ground over Winter by proper covering, will produce a great quantity of seed.

Cress.—There is the garden cress, or pepper grass, and the water cress. The first is well known. It requires a moist and well laboured soil, and if possible a cool and shady situation.—The north side of a wall or fence, is the true place in a garden; and if frequently and abundantly watered, it will arrive at all the perfection of which it is susceptible.

In some places, especially in the neighbourhood of cities whose markets are supplied with it as an early green, pains are taken to propagate the water cress.

CUCUMBER.—There are many sorts of cucumbers, such as the *long prickly*, the *short prickly*, the *cluster*, &c. &c. The cucumber is raised on every description of soil. Having prepared your ground, by digging, and making it smooth, lay it off into squares of six feet. In the centre of each dig a hole about fourteen inches deep: fill this well with rotted dung, and sow on it five or six cucumber seeds; cover this with mould, and when they come up and produce a rough leaf, select two from each hill and draw out the remainder. Some say, only one plant in a hill, alleging that this will bring more weight of fruit than two; and that as you multiply the plants, you decrease the quantity of frnit, the vines are poor and weak, the leaves become yellow, and they bear poor tasteless fruit.

When you have thus obtained your plants, you may proceed with their treatment in several different ways. Some suffer them to take their own course. Others shorten the stem, by pinching off the buds: while others, bury the runners at short distances, and thus obtain new roots from the buried joints.

When the plants show two rough leaves, a shoot or bud will appear in the middle. By the first system, this is to be pinched off, taking care not to injure the plant. The effect of this will be that side shoots will be produced, which in their turn must also be pinched off, leaving only two eyes on each, which will become the future runners, and so to be conducted that they will not shade or crowd each other.

The time for sowing cucumber seed may be the fore part of May; and for Fall or pickling crops, the first or second week in July.

If you wish to have cucumbers earlier than in the ordinary way, they may be had thus. Make a hole under a warm fence, and put some hot dung in it. On this put six inches of fine rich earth, and sow some seeds in it. Cover at night with a carpet, mat, or other thing. When the plants come up and before they show the rough leaf, plant two in a flower pot, and fill as many flower pots in this way as you please; or let the seeds be originally planted in pots, or what perhaps is better, in some large turnips, scooped out and filled with earth for the purpose. The first pots may be plunged in a bed prepared for the purpose, and covered as before, where they are to stand until cucumbers sown in the natural ground come up; when let them be turned out with the ball of earth and planted. Or if you take the turnips, plant turnips and all, and then treat the plants, as if originally sown in

the open ground. In this way you may have fruit nearly a month earlier than otherwise.

If you save a cucumber for seed let it be the first fine fruit that appears on the plant; and it should not be suffered to grow near any thing of the melon, pumpkin, or squash kind.

FENNEL.—This is a perennial plant, propagated from seed or from offsets, and sown or planted either in Spring or Fall. The plants should stand about a foot asunder. It is a tall plant with hairy leaves. The leaves are used in salads; while the seed is applied to several uses. It is a very hardy plant.

HORSE RADISH.—This is best propagated from the root.—Take pieces of root having a bud about two inches in length, and in Spring or Fall set them about a foot deep in the ground. They will spring up the first year, and the second year they will produce abundance of roots for use.

LEEK.—They are a species of onion, and the culture the same, except that it requires more water. Put the rows eight inches asunder, and thin the plants to three inches apart in the row.—To make your leeks superior, hoe frequently between the plants until the middle of July; then take them up, cut their roots off to an inch long. Make trenches like those for celery, only not more than half as deep, and half as wide apart. Manure the trenches with rotten dung or other rich manure. Put in the plants as you do celery plants, and about five inches asunder.—As they grow, earth them up by degrees as you do celery; and at last you will have leeks 18 inches long under ground and as thick as your wrist. Three leeks planted out for seed, will ripen their seed in August and will give you enough for the next year.

LETTUCE.—This is either head lettuce, curled lettuce, or lettuce with straight open leaves. The varieties known by the name of the brown Dutch, capuchin green, and grand admiral, being the most hardy, are those which should be sown in the Fall, to remain in the ground through the Winter, and vegetate early in the Spring. If the soil be clayey, the beds should be thoroughly manured and dug in the month of October, and thrown up into four feet ridges, well trenched, and with an inclination on one of their sides or corners to carry off superfluous moisture. The seed should be sown and covered with a short toothed rake, and afterwards as the frost approaches with a light layer of stable litter. This should be removed in the Spring, and the surface of the beds loosened with an iron toothed rake. The first vegetation that shows itself will be the lettuce, and if too thickly

sown the surplus plants should be taken up and set out in rows for head salad. In warm and sandy soils the treatment is the same, with the exception that the trenches and ridges will be unnecessary; but in every kind of soil the forwardness of the crop will be best assured by a temporary wall or shelter of corn stalks, held together by a few stakes, and so placed as to protect the bed from the north and north-west winds.

The varieties most approved for Spring culture, are the white, the green, and the spotted coss; and for Summer use, the white Dutch, the imperial, the Aleppo, and the green Egyptian.

The straight leaved sort is best cultivated in broad cast, and does not require transplanting, but the curled and the head lettuce will not succeed without it. In Summer culture this is especially necessary, as the lettuce like the cabbage has, at this season, a strong propensity to run to seed, which can only be effectually checked by transplanting. The plants should stand at the distance of ten or twelve inches apart in the rows. The curled sort when the heads begin to spread, should be tied up and they will blanch finely. But it must be observed, that the effect of this is to hasten its seeding.

To have fine lettuces, raise them in the Spring as you would early cabbage plants. Put the plants out into the natural ground about a fortnight before the general corn planting time. Do not put them in a place full to the sun, but in the east or west border. Make the ground rich and strong and break it well, and in transplanting keep as much ground around the roots as you can; transplant in the evening, and give them a little water, and shade them. These plants will loave about the time of early cabbages, and some of them will not go off to seed for six weeks after they are loaved. Let one stand for seed.

The Melon.—Melons are distinguished into the musk and the water melon. Of these species there are many varieties, differing in shape and size, and the colour of the rind and flesh.—The most approved of the musk melons are, the cantelope, the citron, the nutmeg, and the Persian; and of the water melon, the Carolina, the Maltese, the Candia, and the Chate or Egyptian.

Both species and all the varieties succeed best in a hot climate and sandy soil, and in these their culture is easy and alike, not differing from that of the cucumber. The following is given as a successful mode of raising them for market.

Select a spot well defended against the north wind, and open to the sun throughout the day. If such is not to be found in your garden, create a temporary and artificial shelter producing the same effect. At the end of March form holes two feet in diameter, and distant from each other seven feet and a half. Fill

these with horse dung and litter, and a mixture of mould, dung, and sand. At the end of twenty days cover the holes which have been thus filled with hand glasses. When the heat arrives at 36 of Reaumer, sow the seeds four inches apart, and when the plants have acquired two or three leaves, pinch off the end of the branch or runner. This will produce lateral branches, which must again be pinched off, as soon as they respectively attain the length of ten inches. When the plant has out-grown the glass, the latter becomes useless and may be removed; but should the weather be wet or chilly, substitute coverings of clean straw for that of the glass, until the young plant becomes strong enough to bear the open air. Two or three melons only are left to each vine, and under each of these is placed a slate, without which the upper and under sides will not ripen together. Two months are required to mature them. The people of Honfleur attribute their success in melon raising, to the sea vapour which surrounds them, and to the saline particles contained in it—an advantage to be any where commanded, by dissolving a little salt in the water employed to moisten them.

If we want melons at a period earlier than this method will give them, we must employ a higher degree and longer continuance of artificial heat—in a word we must resort to hot-beds, and in these, the point most important and difficult of attainment at the same time, is to secure a certain degree of heat and no more, throughout the process. To lessen the difficulty in this case, gardeners who understand their trade, make choice of those varieties which have the thinnest skins and the least bulk, as experience proves that, other things being equal, they require less heat than those of thicker rinds and greater size, and are of course less subject to some of the accidents to which this species of culture is exposed. In choosing the seeds, those of the last year are only to be used, because they are of quicker vegetation than old ones, and accordingly best fulfil the intention of the hot-bed, which is to give early fruit. Another practice conducive to the safety of the plants, is, to sow the seed in small pots, and then to plunge them into a hot-bed. If the heat be deficient, they are, in this case, made no worse than they would have been, if sown directly in the bed: and if it be excessive, it is only necessary to raise the pots, without in the smallest degree disturbing the plant. These things being premised, it but remains to show what ought to be the subsequent management, after the seed has been sown and the pots placed under the frames.—One of the most important points now to be observed, is, sufficiently to ventilate the bed, as well before as after the plants shew themselves. This should be done at mid-day and in sunshine, and as often as a necessity for it shall be indicated by an accu-

mulation of steam under the glasses. At night, these (the glasses) should be carefully covered with matting. These two preliminaries (ventilation in the day and covering at night) being carefully observed, your plants will soon show themselves in a vigorous and healthy state, and may be kept in that condition by a continuation of the same means, and by moderately moistening the earth, when it shall appear to have become too dry. The water employed should be of the temperature of the air under the frames: and to secure this, it is well to keep a supply of it in a pot placed in a corner of the hot-bed. In about a month, the plants thus raised will be fit for transferring to a second and larger hot-bed, constructed like the preceding, with the exception, that the mass of dung must now be greater, and that after earthing, the bed should not be less than three and a half or four feet in depth. The plants, with the earth in which they grow, are now to be taken from the pots—an operation, in which practice only will make us expert, and which consists in placing the neck of the plant between the first and second finger of the left hand, reversing the pot and gently striking its sides, until the earth be disengaged. The discharged mass is then placed in a hole, previously prepared in the square, where it is intended the plant shall ripen and produce. The male flowers should not be disturbed. When they have fulfilled the intentions of nature, they will fall of themselves—and if the branches be vigorous and long, stretch them carefully over a level surface, and bury every fourth or fifth joint. This is best done by means of a wooden crotchet. The objects of pinching or shortening the stem, are thus completely fulfilled, without any of the risk which attends that operation, and with advantages peculiar to this method, as wherever the plant is buried, new roots are formed for the better nutrition of the stem and the fruit. Melons should be permitted to acquire a bulk, not less than one inch in diameter, before you venture on reducing their number, and no reduction of the leaves should be made at any time; for from the size, number, and thickness of these, and the smallness and little extension of the roots, it is evident that this plant derives more of its nutriment from the atmosphere, than from the earth. If the weather be dry multiply the hoeings, but water sparingly, as many experiments shew that water alters the juices of the fruit, and that though it may augment its quantity, it never fails to degrade its quality.—The ripeness of the musk melon is known by its colour, and its odour, and by the drying of the stem were it attaches itself to the fruit. The water melon furnishes neither of these signs, but affords another peculiar to itself, a hollow sound, on being struck on the rind, the result of an actual hollowness, beginning and increasing with its maturity. The seeds of both species are best

preserved by drying in the shade, and in a portion of their own juice.

THE MUSHROOM.—This is propagated from seed, or what, in technical language, is called *spawn*. These are threads or fibres of a white colour formed in old dung hot-beds, in heaps of rotten horse dung, and compost heaps. It is also found in old pasture grounds or meadows, where mushrooms are observed to grow naturally. But that is best which is found in old dung hills, hot-beds, or compost heaps. These are collected with the lumps of dung or earth in which they are formed, and laid in some dry place covered with dry litter till the bed is ready. September is the best time to look for it. Early in October you prepare your bed.

Select some situation in an elevated part of the hot-bed yard, or in some dry well-sheltered place. The bed should be made entirely on the top of the ground. The width at the bottom not less than four feet, and its length proportioned to the quantity of spawn provided. The material of this bed must be horse dung. Make the bed by shaking some of the longest prepared dung evenly all along the bottom; then take the dung in general, as it comes, and work it into the bed, gradually narrowing it upwards, shaking and mixing the dung, as you proceed, and beating it down with the fork, layer by layer; proceed in this manner drawing in the sides of the bed, till it terminates in a narrow ridge at top, so that the bed when formed, will be like the roof of a house. Make it up about one foot before you begin to draw in the sides. Let each end be sloped in the same manner; and every part made compact and firm; it should be from three to three and a half feet perpendicular height in the centre, when settled. It should then be covered with long straw, to keep out wet and prevent its drying. In this state it should remain ten or twelve days. This is to moderate the temperature of the bed. The straw is then to be removed and a covering of good mould to the depth of an inch laid over the dung. In this the spawn is to be planted in rows six inches asunder, along the sides and ends, making the first or lowest row, six inches from the edge of the bed, and proceeding upwards from row to row to the top, placing the pieces of spawn about six inches asunder, and so far in as to touch the surface of the dung. Then cover the whole about an inch and a half deep with light rich earth, and lay on a light covering of straw as before, just so thick as to keep out wet and prevent the bed from drying.

As the bed decreases in heat and the weather becomes cold, increase the covering to a foot or two feet, and in severe frost to such thickness as may be sufficient to prevent the frost from

reaching the bed. If it were covered with a shed it would be of great advantage.

If your bed has been well constructed, your mushrooms will be fit for use at the end of five or six weeks, and with proper care will continue to bear for several months. When it ceases to produce in consequence of the cold or hard frost, lay a covering of hot stable dung, near a foot thick all over the bed, observing to leave under this, between it and the bed, about three inches thick of dry straw, covering the hot dung over the straw or litter. This will revive the heat, give new action to the spawn, and should be repeated as often as necessary, always observing to preserve the bed from wet, cold, and frost.

Beds made in this way will last three, four, five, and sometimes over twelve months, and when worn out furnish you excellent manure—and the interior of the bed, good spawn.

The method recommended by Mr. Loudon for raising this vegetable without planting the spawn, is more simple than the preparation of an asparagus bed.

"After having laid," says he, "a floor upon the surface of the ground, of ashes, stone chips, gravel, or brick bats, so that the ground will be dry, and free from under-damp, lay a course of horse droppings new from the stable, six inches thick. They must not be broken, and the drier they are the better. They may be collected every day, if your stable does not furnish enough to complete the first layer of the above thickness. But they must not be allowed to ferment or heat. The bed should be exposed to the air as much as possible, while making up, but carefully defended from the wet, if out of doors, or it may be made in a cellar or under a shed. When the first course is quite dry, and supposed to be past a state of fermentation, cover it with two inches of light dry earth. If sandy, so much the better. It is immaterial whether it be rich or not, the only use of the earth being for the spawn to run *en mass* in. Then lay another course of droppings and earth over as before, when it has fermented. Then a third in like manner, and the bed is completed. It should be a little rounded, in order that it may not be more wet or moist in the centre than on its sides. This may be effected by the formation of the floor at first, and the bed will then be of equal strength in all parts. Beds are sometimes made with two courses, instead of three, and when materials are scarce, three four-inch courses with an inch of earth between each, and a two-inch covering or two, have been found to answer."

The flavour of this vegetable is highest in the button state; when the head attains to the diameter of an inch, they are still good; but when fully developed they are not worth picking.

As many of this species are poisonous, it is to be observed that the poisonous fungi are, in general, indicated by a sickly nauseous smell, while the good emit a grateful rich scent. But this is not always certain.

MUSTARD.—There are two sorts, the white and the black.—The white is cultivated to be used in salads with pepper grass, and is sown and cultivated in the same way. Both will grow in a great diversity of soils and with little labour.

The black from which mustard is made, is sown in rows, two feet apart, early in the Spring. The plants ought to be thinned to four or five inches apart, and well tilled between the rows.—The seeds will ripen in July, and then the stalks should be cut off, and when quite dry the seed threshed out and put by for use. But as the pods do not either form or ripen at once, but in succession, we must not delay our harvest until all have been matured. The best rule therefore is, to pull or cut up the crop as soon as the stems become yellow, and carry it into a barn where it may remain covered with straw for a month. At the end of this time it will be fit to thresh, and this is to be done on cloths, and not with flails, which would bruise and break the seed, but with bunches of rods. Passed two or three times through a fanning mill, it will be fit for use.

NASTURTIUM.—An annual plant, with half-red and half-yellow flowers. Its fruit or seed is used when green for pickling.—Sow the seeds early in the Spring, in almost any ground, in drills, and drop the seed two or three inches from each other.—When they are about six inches high, place pretty long bushy sticks for them to run upon.

ONION.—This is a well known vegetable. It has many varieties, distinguished by colour, size, and taste. Of these the red is the largest and most raised. The pale red and the yellow are less in size than the red, and somewhat milder; but the white, though the smallest are the mildest, the soonest fit for use, and the best for keeping.

This root requires a mellow, dry soil, and the richer the better. The soil may be a rich sand, sandy loam, dry loam, or a gravelly loam; or either of these earths, of common quality, when strongly manured, will answer. It is supposed that well rotted and fermented composts, formed of such materials as are most suitable to the soil, will always be found the best manure for this root. In April, or as soon as the ground is sufficiently dry to pulverise well, make it very fine, but not deep; make the rows a foot apart, and scatter the seed thinly an inch or more deep.—

Then fill in the drills, and harden the surface with the back of a shovel.

When the plants are two or three inches high, thin them to four or five inches apart. Or make the drills about ten inches apart, each way, and drop six or eight seeds, where the drills intersect each other. Though the largest onions are those that grow singly, some inches apart, those that are more crowded produce large crops. A small quantity of ashes and sand spread over the ground after planting, is useful. Keep the ground clear of weeds by hoeing and weeding, but do not hoe deep, nor raise earth about the plants. They should be hoed three or four times before the tops have arrived at their full height. After the bulbs begin to swell hoeing must be discontinued. It is said to be very useful, to apply soot and ashes when the bulbs begin to form. Some are in the practice of beating down the tops, after the roots have attained considerable size, for the purpose of making the latter grow the faster; but the practice is no doubt injurious.—When the stalks shrivel and fall spontaneously, they have ceased to grow, and should then be pulled up and laid on the ground some days to dry and harden. If the weather should prove moist, they must be turned, or they will strike new roots and grow. When sufficiently dry, cut off the tops, carry them in and spread them thin over the floor; here let them remain until the commencement of cold weather, then put them into a box or cask with alternate layers of chaff or fine straw, and set them in a place where they will not freeze. A little frost, however, will not essentially injure them, unless they are moved while frozen; but it is better to keep them in a temperature a little above the freezing point. Those which are shipped from New-England, are usually tied up in wisps of straw, and if they be hung up in this way they will perhaps keep longer than any other. If they incline to sprout, sear the roots with a hot iron, which will stop their growth. Those which have thick necks and the bulbous part small, may be left in the ground during Winter. Many of them will stand the frost, and in the Spring may be taken up and set in a bed, where they will grow to be good onions. At all events, they are good for nothing, without a second year's growth; and must not be mixed with good onions, lest they cause them to rot.

To obtain seeds from onions, plant them very early in the Spring in beds, about nine inches apart. Take the largest and soundest for this purpose, and keep them clear of weeds while growing. When they come to head, tie them loosely to stakes drove down for that purpose; otherwise they will fall to the ground, and then the seeds will not come to perfection. In a garden there always ought to be a crop to succeed seed onions.

Onions are not an exhausting crop; and they may be constantly raised on the same ground.

To cultivate onions on a large scale, the ground should be perfectly clear of stones; and if it contain the seed of weeds, these should be first eradicated by a hoed crop. The ploughings, for preparing the land, in the first instance, need not be deeper than 3 or 4 inches. If the ground be suitably mellow, any further ploughings, for succeeding crops, will be unnecessary: all that will be found requisite will be, to re-mellow the ground as deeply and effectually as it can be done by a heavy iron-toothed harrow, having the teeth well pointed, and turning forward, so as to run about two inches deep. But, where the ground is not of the mellow kind, it should be prepared as at first. Whatever manure is applied, should be very finely rotted, clear of the seeds of weeds, and well mixed with the soil by the harrow.—After the surface is finely pulverised, it should be rolled, and then it is fit for the reception of seed.

The sowing should be as early as the ground can be completely prepared. The seeds should be drilled in, in rows about ten or twelve inches apart, by a small hand-drill plough. This machine may be made to drill in two rows at once. The seeds should be drilled in pretty thickly, for fear they may not all vegetate. If the plants are too thick, they must be thinned by hand, when the first weeding commences. This is the most laborious operation in the whole process of raising this root, as well as some others; but here we propose another labour-saving implement, in the shape of a small hand-weeding plough. Every part of the interval between the rows should be cut with this plough; after which it would probably be found requisite to use a small narrow iron-toothed rake, for the purpose of completely separating the roots of the weeds from the soil. After this, the cleansing of the rows of the weeds, which the plough could not touch, must be performed by hand. When the weeds begin to rise again, this operation must be repeated, and again, if it be necessary, as no weeds should be suffered to grow among the crop.

By the use of the drill and the weeding-plough, it is believed that one-half of the labour usually bestowed would be saved.

Onions have been successfully cultivated in light, black, swampy grounds, when sufficiently dry, by small open ditches about three rods apart.

Parsley.—There are three or four varieties of parsley: the fine, the curled, the variegated, and large rooted.

The curled is the most delicate, but most apt to degenerate. The large rooted is the hardiest, least liable to change, most abundant in foliage, and quicker in renewing.

Sow it in the Spring in almost any soil, but that which is light, fresh, and rich, is the best. It is a good while in coming up.—Sow in drills, so as to allow of hoeing between; and keep the ground clean and free from weeds. It is gathered in the Fall, and hung up in parcels for Winter use. It is well, in stiff and moist soils, to protect the roots during Winter.

You may have fresh parsley in the Winter, with a little trouble. Plant some roots in flower pots in the mouth of September, and take care of them in the house, and they will afford a good supply. In the Spring you may again set them out.

Parsnip.—The cultivation directed for the carrot, is equally applicable to the parsnip.

The first crop may be sown in March, and another the first of June for a Winter supply. It thrives best in a rich, deep, light soil, sown in drills, twelve or fourteen inches apart, and the plants eight inches asunder. Parsnips are not injured by frost, and by some, this is thought to improve them. Some may be preserved within doors as beets and carrots, and the rest left standing in the ground.

The Pea.—The best peas for garden culture are the small early or early frame pea, and the marrowfat; the former for early use, and the latter, for an after and more abundant supply.—Plant peas as soon as the ground is in good working condition; and from this time forward once a fortnight or three weeks, to keep up a regular supply for the table. Or it will be a good rule, when the first plants are up, to put in another crop of the same sort for succession. In this way green peas may be had from early in June, till the sharp frosts set in. For the early crop, select the driest and warmest soil in the garden, particularly such as is secured from the north winds, by a tight fence or a wall. Those that are planted late in season ought to be under the south fence, so as to get as much coolness as possible.

After the ground has been well dug, raked, and levelled, mark it out in double rows, about ten inches apart, and leave intervals of three feet for the early small kind; four feet for the larger; and five feet for the largest; so that when they are brushed in proportion to their respective growths, there may be a free passage through the intervals.

Open the trenches three inches deep; and scatter in the peas at the rate of about one to an inch, and then cover them with a rake. The ground should be hoed, and kept clear of weeds; and when the young plants are six inches high, the stems should be earthed up a little, and each double row filled with brush wood, so that each plant may climb, and none of them trail upon

the ground. The brush should be set strongly in the earth, or they will not bear the weight of the plants in windy weather.—Early peas are found to be most productive when planted in separate double rows in different parts of the garden, or with very wide intervals between, which can be cultivated with crops of low plants. In this way they are furnished with a sufficiency of sun and air.

Mr. Cobbett says, "all the sorts may be grown in America, *without sticks*, and even better than with. I have this year (1819, on Long Island,) the finest peas I ever saw, and the most abundant. And this is the manner in which I have cultivated them: I plough the ground into ridges, the tops of which (for the dwarf sorts) were four feet apart; I then put a good parcel of yard dung into the furrows, and ploughed the earth back upon the dung. I then levelled the top of the ridge a little, and drew two drills along upon it at six inches distant from each other. In these I sowed the peas. When the peas were about three inches high, I hoed the ground deep and well between the rows, and on each outside of them. I then ploughed the ground from them, and to them again, in the same way as in the care of Swedish turnips. In a week or two afterwards they had another ploughing, and soon after this they fell, and *lay down the sides of the ridges*. This was the way I managed all the sorts, only in the case of the Knight pea, I put the ridges at six feet asunder.—This was, of every sort, the very finest crop of peas I ever saw in my life. When not sticked and sown upon the level ground, peas fall about *irregularly*, and in case of much wet the under pods rot; but from the ridges they fall regularly, and the wet does not lodge about them. You walk up the furrows to gather the peas, and nothing can be more beautiful or more convenient."

The following remarks on the general advantages of peas, are from the Genesee Farmer.

"The farmers of Great Britain have ascertained, by many years' experience, that no other fallow crops leave the ground in a situation so favourable for a crop of wheat, as leguminous vegetables. At the head of this class may be ranked the pea.—To fallow, and at the same time to have a shading and ameliorating mild crop growing on the fallow, is the system pursued by the best farmers of that country.

"Lime in the soil is considered indispensable to produce this pulse in perfection; and where it does not exist in sufficient quantity, the application of gypsum will be found very beneficial. Nearly all our western lands contain a portion of calcareous matter, which is evidenced by the abundant crops of wheat. As far as my experience goes, no other crop so effectually subdues

and pulverises a heavy clay soil, as peas. On such soil, Fall ploughing is necessary. Early in the Spring roll and harrow, then sow two and a half to three bushels of peas per acre, and cover with the cultivator. When the crop comes off, the ground will be found remarkably mellow, and once ploughing will put it in fine condition to receive wheat.

"By this management, I have raised 20 bushels per acre, and my wheat on the pea ground was the heaviest on my farm. In England, it is not uncommon for a large farmer to have fifty acres of peas, and they find them the most valuable crop for several kinds of stock. Some farmers may say they cannot raise Indian corn in England, and are compelled to fatten their swine with peas. To such I would remark, that a bushel of peas is worth more than one of corn, to bring hogs forward early in the season, and is raised with half the labour. I begin to feed my hogs with peas as soon as they are too old for the table, and find that all is greedily devoured but the straw. I never had hogs to thrive so rapidly on any other kind of food. Corn is indispensable in the latter part of the season to give solidity to pork; but if we were to plant less corn, and sow more peas, we should be gainers by the change.

"A celebrated writer on agriculture says, 'A crop of peas is so far from exhausting the land, that it may be considered as an excellent and ameliorating manure.' Another writer says, 'various crops pulverise the soil, and to a great extent prepare it for different crops. Peas for instance are peculiarly calculated for preparing the ground for wheat.'

"The pea bug (Bruchus pisi) punctures the pod when very young, and deposites an egg. Very few crops escape them, except such as are sowed after the 10th of June. It will therefore be best for every farmer to sow a part after that time for seed, or to keep a sufficient quantity over one year. The last method I have found effectual. If, however, the farmer cannot procure seed clear of bugs, let him heat water in a large kettle, and dip the basket containing the seed into the water when in a boiling state; keep them in not more than one minute, then throw them on a floor and strew on plaster.

"I have sowed the small yellow pea, and the marrowfat, but, if I could obtain them in sufficient quantity, I should much prefer *Bishop's new early dwarf prolific pea*, which I have found in my garden to be the most prolific variety. It seldom attains a height of more than twelve to fourteen inches, and is of fine flavour. When in blossom, they present a beautiful appearance."

PUMPKIN.—The best time for sowing pumpkin seed, is about the middle of May. It will grow in any dry and well laboured

soil; but like most other things, will doubtless grow best in a good one.

It has been usual with farmers to grow their pumpkins in the corn field: whether this is a good practice or not, is somewhat doubtful. A good crop of pumpkins must necessarily take from the sustenance, which would otherwise go to nourish the corn. When planted with Indian corn, they may be put between the hill of corn of every fourth row and every fourth hill, upon a shovelfull of rich manure, two seeds in a hill. When the crop is planted by itself (which it is recommended to do), let the hills be eight or nine feet apart. Two or three plants in a hill are sufficient; though it will be more advisable to put in more seed, to provide against accidents, and the surplus plants can be withdrawn.

Pumpkins, if steam boiled, are a rich food for swine; but the seed should be first taken out, as these are injurious to the animal. They are also a good food for horses and cattle.

Let it be remembered, that to preserve the crop pure, the seed should not be taken from plants growing near squashes, as both these deteriorate each other.

Radish.—Of this there are two species—the long and the round; the latter is sometimes called the turnip radish. This root should be sown in a light rich soil, in drills six inches asunder. Sowing may commence early in the Spring, and be repeated at intervals of a fortnight or three weeks, to keep up the product.

Rampion.—The roots of this plant are used as an ingredient in salads. The seed is very small, and should be sown thin in the month of June. A loose moist soil and shady situation, suits this plant.

Rhubarb (*Pie Plant*).—This is a very valuable plant, and only requires to be known to receive general cultivation; it has the important recommendation of presenting itself for the table, when few others for a similar purpose are to be had. The petioles or stems of its large fan-like leaf, are the part to be prepared. When the leaf is fully expanded, cut it close to the main stem, remove the green top, then deprive the stalk of its outer skin by stripping it down, and not by cutting with a knife; then cut it in small lumps, not too thin, and either boil it in dumplings made of short paste, or bake it in tarts, using sugar, lemon, &c. to the taste. It is found greatly to improve the flavour of apple tarts or pies, by mixing in the proportion of one-third to two-thirds of apple. The latter fruit having been kept through the

Winter, generally loses its flavour, and becomes flat and insipid. But the good housewife will soon find a variety of ways to cook this delightful plant. It has the reputation of being very serviceable in aiding the discharge of bile.

The medical rhubarb, which is the dried root of this plant, is principally brought from the mountains of Tartary. It grows there in great abundance upon the declivities of the mountains, preferring a light sandy soil, on the south side, but in the shade; therefore procure a place in a warm shady border of your garden, loosen the earth *far* and *deep*, enrich the spot with some rich light soil, and place the root upon a small quantity of old stable manure, so that its top, before any leaves have started, be six inches below the surface; over the crown of the root strew a little more manure, and cover it with fine mould. In the Spring, when the leaves begin to appear above the ground, draw the earth round them; and when the stem of the leaf has attained the length of six or eight inches, they may be cut for use. The main stem will attain the height of six or eight feet. The root for planting may be obtained at the seed stores and nurseries.

As early as February or March, some growers of this plant put barrels or large boxes over the plants, and cover the whole with heating manure. Thus treated they grow very rapidly.—Others let them stand in open warm situations, taking no other pains than keeping the ground free from weeds, and cutting the leaves as wanted. They are propagated by separating the suckers or roots from the main stem. In a few years one plant will make a dozen or more.

ROSEMARY.—Propagated by slips taken off in the Spring, and set out in some cool place. Set six inches apart, and insert two-thirds of their length in the ground. They will take root freely, and by September be fit for transplanting any where.

RUE.—Propagated in the same manner as rosemary. Its beauty is much increased by lopping the branches close to the earth, every fourth year.

SAGE.—Raised from seed or from slips, in like manner as the preceding. Sage, as all other herbs dried and laid up for Winter, should be gathered before it comes out into bloom. Fine healthy plants are kept up by renewing every three or four years.

SALSAFY, *or Oyster Plant.*—This is cultivated both for its shoots and roots. The shoots rising in the Spring from year-old plants, are gathered and eaten like asparagus. The roots are boiled or stewed, like parsnips or carrots. The salsafy requires

a deep and humid soil. The seed should be sown in drills eight or ten inches apart, covering them in about half an inch; and the plants thinned out in May, and left from four to six inches asunder. Two hoeings, and frequent waterings during dry and hot weather, will be indispensable. They attain their full size in Autumn, and then should be taken up and preserved as other Winter vegetables, in sand or litter. Plants intended for seed should be preserved in the ground by a proper covering through the Winter.

SAVORY.—Of this there are two sorts, *Winter* and *Summer*, the former being perennial, the latter annual. It is propagated from seeds or slips, in almost any sort of soil. It is said that the Winter savory grows best in barren sands and bleak situations.

SHALOT.—A small onion, taken up in the Fall and kept for Winter use. Each plant multiplies itself in Summer, by adding offsets all around it. These offsets are set out in the Spring, and produce others for use and planting out again. They should be planted in rows six inches apart, and four inches apart in the rows. The ground should not be wet at bottom, and be kept very clean during the Summer.

SKIRRET.—This is cultivated for its roots, which are used in soup. The seeds may be sown thin on beds of good earth, in drills, and raked in; or it may be propagated by parting the roots, and planting them at six or eight inches distance. Cultivation, the same as the parsnip.

SORREL.—The sorrel is propagated from seeds or from offsets. All soils not positively dry or wet, are adapted to it. The seeds are sown in the Spring, the offsets put down in the Fall. In using it, some gardeners cut off an entire tuft close to the ground; but a better mode is to crop the outer leaves first, leaving the central ones to be taken last. This leaves it in a more favourable state to re-produce.

SPINACH.—Spinach for Summer use is sown in the Spring as soon as the frost is out of the ground, and every three or four weeks following to keep up a regular supply. The seed for the Spring and Summer, is the smooth and round sort. The Fall sowing, which is to produce a Spring crop, should be made about the middle of October. It may be sown broadcast, or in drills six inches apart, and lightly covered. A moist rich loam is the suitable soil, well dug and manured; and the plants covered with straw during the Winter, to protect them from the severe frosts.

THE SQUASH.—The soil and culture suitable to the squash, is the same as for the pumpkin.

THYME—Is propagated from seeds and offsets, in a poor, light and warm soil. It should be changed as to place every three or four years. It may be set in rows or in bunches.

TOMATUM.—Of this there are two sorts, the small and the larger; the smaller ripens first, and resists the cold weather better than the larger. Early crops are procured by sowing the seed in a dry and warm soil and sheltered situation in October, and covering the bed with straw or stable dung during the Winter. For Summer and Fall use, sow in May, and water freely. The distance between the plants should not be less than two feet. As this plant is a considerable climber, bushy sticks are necessary to fasten them on. Seeds of the tomatum, if sown in pots in March, and placed in the house, will be strong plants in May, forward enough to set out.

TURNIP.—(See Part I.)

WORMWOOD.—A medicinal plant, propagated from seeds, slips, and offsets.

GARDEN FRUIT.

IT is intended here to treat merely of such fruits, the product of woody plants, as have not been treated of under the head of the Orchard. To these will be added some others, which are usually cultivated in the garden.

THE CRANBERRY.—This is a native of New Holland, Europe, and America; it grows spontaneously in the flat sandy, and some of the mossy bogs, in this country; and grows most luxuriantly in soils composed almost wholly of beach sand, where water at all seasons of the year can be obtained a few inches below the surface. It can be profitably cultivated. Mr. Henry Hall, of Barnstable, Mass., has been engaged in the cultivation of this fruit for upwards of twenty years, and his grounds have averaged about seventy bushels per acre annually. Mr. Hall practised taking the plants from their natural situations in Autumn, with balls of earth about their roots, and setting them three or four feet distant from each other. In the course of a few years they spread out and covered the whole surface of the ground, requiring no other care thereafter, except keeping the ground so well drained as to prevent water from standing on the vines.

The cranberry may be propagated from the seed. It should be planted in Autumn as soon as the seed is ripe, and a year afterwards the plants may be transplanted to the situations where it is intended for them to grow. There are many situations in this country well adapted to the profitable cultivation of the cranberry. Grounds that are overgrown with fine rushes or moss, may be rendered suitable by spreading over a dressing of beach sand, previous to transplanting the vines.

The cranberry can always be made to thrive on the margin of a pond. Inclose a portion of the pond by stakes, fill the bottom with stones, and on these place a stratum of bog earth, raised to the ordinary level of the pond, and upon this plant a few cranberries. The runners will soon and completely cover the bed, and your harvests will be abundant and regular, never suffering either from weather or insects.

THE CURRANT.—Currants are red, white, and black; they are great and constant bearers, and will grow upon all varieties of soil. Although the white and red currant are claimed as natives of Great Britain, yet they flourish much better in the northern part of the United States, than they do in that country.

As the currant is useful, so the bush may be rendered quite ornamental, if proper pains be taken with them at first.

Those who wish to have a good supply of fruit, and at the same time have their bushes ornamental, should procure as many straight well-proportioned sprouts of the last year's growth, as are desired to cultivate. Let these be cut off a couple of inches above where they commenced the year's growth, or where the buds become regular. With a sharp penknife scollop out each bud, beginning at the bottom and proceeding up at least one foot, or so far as you wish the stem of your bush to remain clear of limbs. In doing this be careful that not one bud is left on what is designed to go into the ground, or on what is designed for the body of the bush. Stick the sprouts thus prepared in the ground, either where they are to remain, or they may be put for one year in nursery form, and afterwards transplanted. Bushes properly prepared in this manner are as sure to live as those that have roots, and never will sprout from that part where the buds were cut out.

Every one who has attempted to train a currant bush as a standard, knows well what a task it is to keep down the sprouts from the bottom, which if left render it very unsightly. When bushes are trained in this way, the tops may be kept open so as to admit the sun and air, and the currants will not only be larger but better flavoured.

When currants are intended to be cultivated on an extensive

scale for the purpose of making wine, let the bushes be set in rows six or eight feet apart, and the bushes about three feet from each other. It is thought that an acre of ground well cultivated, will yield fruit enough to make a thousand gallons of wine annually.

To make wine from currants; gather your currants when fully ripe, which will commonly be about the middle of July; break them well in a tub or vat, (some have a mill constructed for the purpose, consisting of a hopper, fixed upon two lignum vitæ rollers); press and measure your juice, add an equal quantity of water, and to each gallon of that mixture add three and a half pounds of clean and good Muscovado sugar (the lighter coloured and drier the better). Stir it well till the sugar is quite dissolved, and then put it in your cask. If you can possibly prevent it, do not let the juice stand over night, as it should not ferment before mixture.

Observe that your casks be sweet and clean, and such as never have had either beer or cider in them; and if new, let them be well seasoned. Do not fill your casks too full, otherwise they will work out at the bung, which is by no means good for the wine. Rather make a proportionable quantity over and above, that after drawing off the wine you may have a sufficiency to fill up the casks.

Lay the bung lightly on the hole, to prevent insects from getting in. In three weeks or a month after making, the bung-hole may be stopped up, leaving only the vent-hole open till it has fully done working, which is generally about the latter end of October. It may then be racked off into other clean casks; but experience seems to favour letting the wine stand on the lees till Spring, as it thereby attains a stronger body, and is by that means in a great measure divested of that sweet, luscious taste, peculiar to made wine; and if not wanted for present consumption, it may without any damage stand two years on the lees.

THE GOOSEBERRY.—The gooseberry is generally propagated from cuttings, though like many other plants it may be raised from seeds or suckers. The directions given under the last head for currants, are equally applicable to the gooseberry. An annual labour is necessary about the roots of the gooseberry, and unless the soil be uncommonly rich, an annual dressing of stable manure or peat earth. The bushes should not be subjected to too much shade, as this is injurious both to the plant and fruit. Keep the head of the bush open by trimming out redundant branches; and in performing this operation, the Summer shoots should not be removed.

Gooseberry trees are liable to attacks from the caterpillar,

which, as in other cases, after having perfected its growth descends into the ground, where it remains during the Winter. The remedies for this may be the same as those recommended under the head of the Orchard, with regard to the destruction of worms and insects infesting the fruit trees. But perhaps after all, the only successful remedy is removing them by hand. This may be a tedious process; but the number of plants in a garden is not usually so great, but that for the sake of having this fruit, it may be worth the trouble.

A wine is made from gooseberries in the same manner as currant wine, except that one-third less sugar is required. But to have this of a superior quality, it is recommended to dissolve three pounds of white sugar in four quarts of water; boil it a quarter of an hour, skim it well, and let it stand until it is almost cold; then take four gallons of full ripe gooseberries, bruise them in a mortar, and put them into your vessel; then pour in your liquor, and let it stand two days, stirring it every four hours. Steep half an ounce of isinglass, chipped, in a quart of brandy two days; strain the wine through a flannel bag into a cask; then beat the isinglass and brandy in a mortar with the whites of five eggs, whisk them together half an hour, put in the wine, and beat them all together; close up the cask, and put clay over the cork; let it stand six months, then bottle it off for use; put in each bottle a small lump of sugar and two jar raisins. This is a very rich wine; and when it has been kept in the bottles two or three years, will drink like Champagne.

THE RASPBERRY.—The raspberry is perpetuated by young sucker shoots rising up from the root in Spring and Summer. When these have completed one season's growth, they are proper to detach, with roots, for planting either in the Autumn of the same year, or the next Spring. These new plants will bear some fruit the same year, and furnish a succession of strong bottom shoots for full bearing the second season.

All the varieties will succeed in any common mould, trenched about two feet deep, and sufficiently manured. But the soil in which the raspberry bush most prospers, and bears the finest fruit, is a light rich loam. They should be placed in borders a little shaded. When raspberries are cultivated on a large scale, it is best to keep them in plantations by themselves. Set them in rows from four to six feet asunder (as the bushes are of the smaller or larger kind), by three or four feet in each row. Scattered bushes may either occupy a single row lengthways along the back part of a border, or stand in detached stools at ten or fifteen feet distant. Select sorts are frequently trained against

walls, stakes, or espaliers, from the most sunny to the most shady aspect, for early and late fruit of improved growth and flavour.

Raspberry bushes are in their prime about the third and fourth year, and if well managed continue in perfection five or six years, after which they are apt to decline in growth, and the fruit to become small, so that a successive plantation should be provided in time. Select new plants from vigorous stools, in full perfection as to bearing.

For Summer culture, the plants should be kept clear from weeds by hoeing between the rows, at the same time loosening the earth about the plants. As the plants get established, let all straggling suckers between the rows, or from the extreme roots of single stools, be cleared out by hoeing or twisted off, to admit the air and sun freely to the fruit.

It is requisite every Winter or Spring, to cut out the dead stems, and to thin and regulate the successional young shoots. This annual pruning may be performed any time during open weather from November to the beginning of April. When vegetables of any kind are cultivated between the rows, it is most convenient to do this as soon as the old bearers begin to decay. As to pruning indiscriminately in the open weather of Winter, it sometimes happens that severe frosts immediately follow, and partially kill the plants; therefore it is safer to shorten the tender young stems early in the Spring. But let it not be deferred till the buds are making new shoots, as that would weaken the root. Cut out all the old dead stems to the bottom, and having selected from the strongest young shoots on each main stool three, four, or five, to be preserved for a succession of bearers, cut away the superabundant ones close to the ground. Let each of the shoots retained be pruned at the top, below the weak bending part, cutting in the smaller plants to about three or four feet in length, and in the large sorts to the length of five or six feet. If any of the stems diverge irregularly or straggle much asunder, they may be tied together at the top, and thus they will support each other, or the taller varieties may have the support of stakes. After pruning, having cleared away the cuttings, dig the ground between and about the plants. Turning in a little rich compost every year, will conduce to plentiful and fine returns; lay it on at the extremities of the roots, and deeper as the plantation gets older.

With respect to the choice of sorts, the large common raspberry (both red and white) give good fruit and a great deal of it, if properly managed. The large red and white are certainly superior, but more troublesome, as they are not productive but when laid down and protected from the Winter frosts.

STRAWBERRY.—Of strawberries, the sorts are the Pine, the Single Leaf, the Chili, the Carolina, the Scarlet, the Wood, the Hautboy, and the Alpine. All the varieties are hardy perennial plants, which flower in May or June, producing perfect fruit in June, July, and August, and even until November. They may be propagated by planting offsets or suckers in any light, rich, garden soil, where they annually yield abundant crops, if properly weeded and supplied with moisture. Their fertility, however, will be considerably increased, by transplanting them every second year into fresh beds, that have previously been dug or otherwise prepared for their reception.

In preparing the ground for a strawberry bed, if new and stiff trench it; but if the subsoil be of an inferior kind, simply dig it, and place the dung at the bottom; if again the soil be good to the full depth, bring the bottom spit to the top and the top spit to the bottom, and place the dung between the two. Early in the Spring is the time for planting either seedlings or runners; and remember to make your plantations of *these*, and never from old plants. Some make their beds in the Fall, early enough to give the plant time to take root before Winter. Sow in beds of three or four rows, with alleys between the beds to walk and work in. Let the rows be a foot apart, and the plants eight inches apart in the row. When the plantation is finished, keep the bed free from weeds, and permit no crops between the rows. When the runners begin to show themselves, cut them away at least three times in the season; and at each cutting dig the ground between the rows, and as often cover the surface with a sprinkling of clean straw, for the purpose principally of preventing evaporation. One of these cuttings must be done a short time before the fruit ripens, and will have a powerful effect in strengthening the roots; and at the second digging work into the rows a little half-rotted dung; or take three parts of old rotten dung, one part of soot, and a similar portion of dry soap-boiler's ashes, mix them thoroughly, and spread this compost loosely by the hand, so that the newly moved ground may be superficially covered.

To promote the growth of the berries, the contiguous earth around the stocks may be covered in the Spring with tanner's bark, or where that cannot be procured, with oyster shells; thus all weeds will be effectually suppressed, and an uniform beneficial moisture may be insured. Perhaps in this case the tan should have been subjected to the snows and rains of one Winter, lest there might be too much astringency in it.

It is best to gather the fruit in dry weather. Berries gathered early in the morning and late in the evening, keep the best; but those picked at mid-day have the most perfume.

New beds of strawberries should be made every four years;

and in making it care should be taken to avoid putting out any black roots, as all such have lost their vegetative power. A new bed made every year, would always keep up a good supply.

To preserve the fruit of strawberries free from grit, and the attack of slugs, a writer in the Gardener's Magazine recommends, in cases where the larger sorts are grown and the rows are some distance apart, to lay short grass between them, two or three inches thick. It is not only useful, he says, for the purpose of protection, but it acts as a non-conductor of evaporation from the soil below, whether you water it artificially, or the more general rain administer the moisture; it also chokes most sorts of weeds, and destroys the vegetation of their seeds; and it may be taken off, or allowed to remain, after the crop is done. It is best to apply it in a dry time, before the strawberries begin to get ripe, when the slugs have sought shelter in less exposed situations, after which it forms so bad a path for them to slide along, that they cannot overcome the difficulty. If any should remain, a watering with lime-water, or urine, will extirpate them.

THE BLACKBERRY.—This is one of our native shrubs, and well deserves a place in the farmer's garden, and will liberally repay the expense of cultivation. It should be propagated and pruned in every respect like the raspberry, but being somewhat larger requires more room. It is very much disposed to throw off young shoots from the roots; and unless great care is taken to destroy them they will spread and fill the ground, and soon make an impenetrable wild. But there is no difficulty in keeping them down if the space between the rows is well wrought, and kept as it ought to be free from grass or weeds.

The blackberry, as well as the several kinds of raspberries, does not ripen its fruit at once, but in succession for several weeks, as if designed to court our notice, and fully to reward the care we may bestow upon its cultivation, by a frequent offer of its bounties.

The fruit should be regularly gathered as it comes to perfection, and be directly used after being picked; for although they may remain good on the bush a few days after being ripe, if kept in the house a single day they will be found to have lost much of their delicious flavour.

A plantation of these shrubs will come to perfection in three or four years, and if nursed as above directed, will continue fruitful for eight or ten years. It should then be grubbed up, and entirely renewed. Two years, however, before this, a new piece of ground for this fruit should be prepared.

The ground upon which old shrubs have stood will be found to be greatly improved, and should now be prepared for some other use.

CULTURE OF THE GRAPE VINE.—We introduce the subject of the culture of the grape vine, with the following remarks of Mr. Goodsell.

It is now well established by experiments, that our climate is well calculated for the cultivation of the finest of the American species of grapes, and well adapted to produce strong growths of most of the finer varieties of European vines, with corresponding crops of fruit, so long as they can be kept free from that parasitic plant, generally though improperly called mildew.

That the American grapes are capable of making a wine equally as pleasant, as those in common use in France and Germany, we verily believe; but since those vines are little known in this country, and as our tastes and opinions are made up upon Madeira wines, it is impossible to say how long a prejudice will exist, as at present, in favour of that as the only perfect wine, and the only wine that it is desirable to imitate. So long as that prejudice does exist, so long we shall either be disappointed in producing the desired article, or if we produce it we shall do it to the injury of the country.

It will be of little use for our temperance societies, to make exertions to banish brandy from our tables, if Madeira wine is to be used as a substitute; or to prevent the use of pure alcohol and water, if we use the same quantity which only differs in having vegetable extract in it.

The French and German wines are light, and are used to prevent thirst rather than promote intoxication; and as most of them are rather astringent, they act as tonics upon the stomach rather than stimulants of the brain.

Grapes are not only useful for making wine, but are generally preferred to all other kinds of fruit for the table, and there is no good reason why our tables are not supplied with them eight months in a year, without incurring any very material expense, as half a dozen vines would be sufficient for that purpose.

The following are the varieties that we should recommend of both American and European varieties.

AMERICAN VARIETIES.

Catawba.—Although the Isabella grape has generally been placed at the head of the lists, we put the Catawba, as we consider it superior in many respects to the Isabella. It is shorter jointed, and if possible a better bearer. It endures our Winters, and the grapes keep better in jars than the Isabella. As a wine grape it is undoubtedly superior.

Isabella.—Second to none unless it is the Catawba, and all its qualities taken into consideration. Grows freely, endures our Winters well, is a great bearer, and a fine table fruit.

Bullet Grape.—There are several varieties of this grape culti-

vated under different names, as Muscadine, black Scuppernong, and Muscadel, all meaning a small round grape of dark purple colour, rather sour than sweet, with thin smooth leaves, destitute of down beneath, free growers, and endure our Winters perfectly.

Red Bland.—A fine grape well flavoured, but the seasons in this vicinity are not sufficiently long to perfect the fruit.

EUROPEAN VARIETIES.

White Frontignac.—This is an oblong grape, of good size, large clusters, weighing from one to two pounds, fine flavoured, and a great bearer, but the vines, like all other European vines, are subject to mildew; requires a slight covering in Winter.

White Sweet Water, or Chasselas.—A round grape of good size, and certainly one of the most pleasant grapes for the table, a good bearer, vines require protecting during the Winter. Vines subject to mildew.

Munier.—This is one of the hardiest of the European varieties, a good bearer, fruit small, and thick set upon the clusters, rather acid but pleasant, colour dark purple.

The above mentioned is all that is needed to form the best suite of grapes for table use and making wine.

We would add to Mr. Goodsell's list, the black Hamburg and Constantia.

Soil and Situation.—Many appearances indicate that the vine is indifferent to the nature of the soil in which it grows, as *it* is found to live in almost any soil; still these appearances are deceitful, for the vine like all other families of the vegetable creation, seeks a soil and situation congenial to it. It is under southern and eastern aspects, and in soils light and warm, and of a medium quality as to strength, that the vine attains that degree of perfection of which it is susceptible. It is the last mentioned circumstance that directs us in the choice and application of manures, and which forbids those of a heating quality, or of any quality in large quantities. The fresh mould of old pastures, the scrapings of streets, and composts composed of stable litter, the leaves of trees, weeds in a green state, and animal remains of all kinds (as hair, skins, bones, feathers, &c. thoroughly rotted), and applied in moderate portions every second year, forms the most approved practice on this head.

But that much may be done in the cultivation of the vine independent of the soil, is proved from the fact, that the best grapes which are brought to the market of Paris, are produced at a place (Thomery, near Fontainbleau) which in soil and situation is thought to be naturally altogether unfavorable to their culture. The soil is clayey, cold, hard to cultivate, and in many parts sterile, having a northern and eastern exposure. Yet the

grapes from this place, the Chasselas of Fontainbleau, are the most celebrated of any that come to Paris.

Planting.—Timothy Matlack, Esq. in a letter to the President of the Philadelphia Agricultural Society, on the subject of the culture of the vine, gives the following directions for managing the cutting.

"What follows is to be considered as a simple, plain lesson, and it shall be confined to the consideration of a single vine; because if the cultivation of one vine is well understood, the application of that knowledge to any number, is an operation of plain common sense only.

"In February (or later according to the climate) take a single joint of the vine you choose, the "genuine Tokay," if you can find it, cut it off at half an inch above the eye, and again at two inches below the eye, cover each end with a sticking plaster of any kind (as wax and rosin,) and set it in a pot of garden mould, (of about five or six inches diameter). The eye of the cutting must be covered with earth, and then watered to settle the ground.

"After this lay half an inch of horse manure on the surface to keep it from becoming dry and hard. Place the pot in your hot-bed, prepared for raising your cabbage plants, whenever that is ready. (Or the pot may be set in some warm place, or the pot and hot-bed may both undoubtedly be dispensed with, and the joint of the vine planted directly into some warm part of the garden, early in the opening of the Spring.) The vine will require no further care than that extended to your cabbage plants. If more than one shoot rises from the eye, rub off all but the strongest.

"About the first of June, turn out the vine from the pot and set it in your garden, or at the east or north end of your house, wherever it can be protected from violence. It will grow in any soil, but, like other plants, it grows best in the best soil. When first removed, water it at a distance from the plant so as to draw the ground towards the vine instead of washing the ground from it.

"If you water it afterwards, pour the water into a trench at least eighteen inches from the plant; for unless this precaution be used, watering does more harm than good, and does most injury in the driest time. As the vine shoots upward, it must be supported from falling. No other care than keeping the ground clear of weeds is necessary for the first Summer. In November, a slight covering of straw is beneficial in preventing a frequent freezing and thawing of the vine.

"In February it must be trimmed; and here commences what I conceive to be the sole difficulty in cultivating the vine—to wit,

to determine at which of the eyes it is to be cut off. What is here about to be said, deserves the more attention, as it applies to every succeeding cutting of the vine in every stage of its existence: goes directly to the ground and principle of its cultivation, and will not be found in any author who has written on this subject.

"Every joint of a grape vine has its own separate pith.—This most important circumstance commences at the lowest leaf that has a *clasper* opposite to the leaf. (The claspers are the barren fruit stems, whose chief office is to support the vine and the clusters below them.) A solid woody substance passing from the leaf to the clasper, through the vine, and connecting them together, cuts off entirely the communication between the pith and the joint below, with that of the joint next above; and so on, upward, at every joint through the whole length of the vine.

"And it is a circumstance not less important to be known, and kept in mind, that all the eyes below this first clasper are formed in the bosom of smaller and more feeble leaves: and that the base of those eyes does not extend across the vine, so as entirely to cut off the pith of the joint below, from that of the next joint above it; these eyes are imperfect, and whenever you trim the vine, ought to be rubbed off.

"It is at this first trimming of the vine, that we begin to apply the principle above laid down, and it is here only that there ever can be any difficulty in the application of it; and this difficulty can only arise from the circumstance of so very feeble a growth in the vine, as not to have produced a clasper in any part of it, which will seldom happen; but if it should happen, the vine must be cut off at half an inch above the first clasper, and in both cases all the eyes below are to be carefully rubbed off.

"The eye thus left on will sometimes produce more than one shoot, in which case all but the strongest should be rubbed off, and that supported from falling down; which, except keeping the ground free from weeds, is all the care required for this year. In November, this shoot is again to be covered as before directed, and in the following February is again to be cut off just above the second lowest clasper, that is, leaving on *two eyes* to shoot this season, and again rubbing off all the eyes below the lowest clasper.

"Both these shoots should be permitted to grow to their utmost length; which if the soil be favourable, will be very considerable, and there will be reason to hope for fruit the next season. Here you ought to be apprised that the lowest clasper appears higher up on some kinds of the vine, than on others; on some it appears at the third leaf, on some at the fourth, on some

kinds so high up as the fifth leaf; but the same rule is to be alike applied to all, and every eye below the lowest clasper be rubbed off.

"In the third February cutting, three eyes upon each shoot may be left on and not more, however strong the shoots may be. From this time forward all the side branches from the shoots of the year are to be rubbed off, taking great care not to injure the leaf from whence they spring, which is the nurse of the bud at the root of its stem.

"At the fourth time of cutting the vine, and from that time forward, it may be cut about the last of October, four eyes on each shoot may be left: and at the fifth cutting five eyes on each shoot may be left on, but more than five eyes on a shoot ought never to be left on, even in the most vigorous state of growth, at any age of the vine: for, however pleasing the increase for the year may be, the injury thereby done to the vine, will be seen and lamented in the following, and probably many succeeding years.

"If it be inquired why a single eye is recommended, rather than a cutting of sixteen inches long, it is replied, that roots shooting from a single eye, are exclusively from itself, are much the strongest, and strike more directly downwards; the shoot from it has less pith in it, the wood is firmer and shorter jointed, and comes sooner into full bearing; and appears to be much the most healthy vine.

"And to these important advantages may be truly added, that a thousand plants fit to set out, may be raised from a single eye with less labour and within less space, either in a hot-bed, or in the open ground, than a hundred plants can be raised from long cuttings; which have not, that I know of, one single advantage in their favour; and, in a new country, it is of no small consideration that the same cuttings will produce five times the number of plants.

"As to the manner of accommodating your vine to its situation, an active imagination would suggest a volume upon the subject, and possibly unluckily miss the only direction suited to the case; but, fortunately, the fact is, that a very small share of common sense will in all cases be fully sufficient to supply the deficiency; and very little more will be required to apply the principle and practice here laid down, to an hundred or a thousand vines, whenever the people of the country shall feel the advantage, or necessity, of raising vineyards for the supply of wine within ourselves."

Should any prefer the ordinary mode of planting the cutting in the open ground, the following directions may be observed.

Take your cuttings having four or five buds or joints; put

the lower ends of them in water about five or six inches, setting them upright for six or eight hours before they are used; then with a spade or other instrument make a hole about a foot or fifteen inches deep; into this put the cutting, leaving two buds or joints above ground; let it be placed a little sloping; then fill up the hole with rich earth, pressing it gently with the feet to the cutting. Some raise a little hillock around each, so as just to cover the upper eye or bud, which will prevent the wind or sun from drying any part of the cutting; and this upper eye only will shoot, the under ones most of them will push out roots, so that this shoot will be very strong and vigorous. Cuttings should be taken from shoots of the last year, and set out as soon as the ground is open in the Spring.

Training.—There are various modes of training the grape vine. This may often be done to suit circumstances, and then a very small share of common sense will be our best director.

There appears to be very considerable concurrent testimony in favour of low training to prevent mildew; or rather, those grapes found growing very near the ground are found to be less liable to this malady. On the supposition that mildew is a parasitic plant, and that moisture is favourable to its germination and increase, the inquiry arises, are these low grapes less moistened by dews and rains than those that are higher? In ordinary seasons we think they are. They are protected from dews, mists, and light rains, by the over incumbent leaves and branches. Although they are not as early dried by the rays of the morning sun, yet the moisture is more gradually evaporated, and they receive more radiated heat from the earth.

In the large vineyards of France and Germany, the standard form is generally adopted; which consists in reducing the plant to a bush of two or three shoots, and keeping these erect by a stake. The shoots will give each two or three bunches within fifteen or eighteen inches from the earth, and are naturally succeeded by others, which in their turn become bearers. Where the culture in a garden is limited to two or three vines these are sometimes trained over arbours; but the confinement of the air, and the great shade usually produced in this way, is not favourable to the growth and ripening of the fruit; besides, this method affords a shelter for insects.

Open training in the garden is best. Let us suppose your vine set out in the garden, or a cutting planted there, as before directed. We suppose you let but one shoot grow from this, for that will be sufficient. When Fall comes, or in the Spring, whichever time you choose for pruning, cut this down to the bud nearest the ground, or if you please leave two to guard against accidents. The next year another and much stronger shoot will

come out, for you are to let but one of these eyes grow, and if both shoot rub one off. When the time for trimming comes again, this shoot will be of considerable length, having been tied to a stake as it rose. You now then cut off your vine, leaving eight buds or joints: or leave your vine in such state as to have the next year eight good branches at proper distances from each other. You now prepare your trellis, which may consist of upright bars five or six feet high, placed in a line, the way you mean to train your vine, at convenient distances. If you allow sixteen feet for your vine, that is eight feet each way from the centre, four of these may be sufficient. As your eight shoots come out and proceed on, they are to be tied to these bars, four trained each way from the centre. If your shoots go beyond the last bar at the distance of eight feet from the centre, you may cut it off to that at the next pruning. You will have at that time eight shoots; if these were suffered to grow, they would all next year send out bearers, but if you suffer that you will have a great quantity of small wood and little or no fruit that year.—Therefore cut off four of the last year's shoots, two on each side of the vine, leaving the two alternate ones, and on each shoot only one bud. The four shoots will send out a shoot from every one of these buds. These new shoots will grow during the Summer, while the four that were left at the last pruning will produce you fruit. You then have four bearers and four shoots to become bearers the following year. When the time for trimming comes again, you are to cut off the four shoots that sent out the bearers during the Summer, and leave the four new shoots that grew out of the buts. Cut the four old shoots so as to leave but one bud as before. And they will then be sending out wood, while the other four will be sending out fruit. And thus you go on year after year continually.

For open or Vineyard Culture.—The first year suffer but a single shoot and that the lowest to grow, the supernumerary ones may be checked and taken off gradually; this shoot is to be trained to a pole, the lateral shoots to be taken off as they are produced, at the distance of a single eye from the main stem. When a few feet in height the top is to be occasionally nipped in. Late in October, cut this down to two good eyes; in November (if a European vine) bury with leaves, litter, or soil. The next year three good eyes are only suffered to grow, which are to be trained to a pole and pruned as before. In Autumn preserve the two uppermost, which if strong must be cut to the length of five feet and trimmed throughout, and secured to the surface by hooks and covered with soil. The remaining one is shortened to three good eyes, and buried as in the former year. In the following Spring, two good stakes will be required; the vines left at full

length are each to be twisted several times around a pole and secured at top, and then will throw out shoots from every eye, which will each probably produce two bunches. These bearing shoots are to be nipped (shortened) in four or five eyes beyond the fruit. The shoot cut down will this year furnish three shoots, these are to be trained as at first directed to another pole, for these three are to furnish fruit for the following year, and are to be pruned and laid down at full length in Autumn. As to those which have once borne fruit, they are not permitted to bear fruit a second time, but are each cut down to two eyes, to furnish the reserve wood for the following year; and so proceed till four bearing limbs are annually elevated and twisted around two poles, and an equal number of supernumerary or reserve branches are annually raised up and trained to two other poles. Always observe to cut so as to have your wood start from a low point near the surface; for this purpose it may be sometimes necessary to cut back the old wood.

In the disposition of a vineyard, Dufour proposes to plant the vines in rows not less than six nor more than eight feet apart; and to set the vines in the rows, at two and a half or three feet distant. At six feet by two and a half, an acre will contain 2904 vines; and at six feet by three, 2420.

Mr. Adlum thinks it is an error to plant vines at so small a distance from each other; he says, "and herein most people who have planted vineyards have greatly erred, some having allowed not more than five feet from row to row, and the plants but three feet asunder in the rows; and others who think they have been full liberal in this article have only planted their vines at six feet apart every way; but neither of these have allowed a proper distance to them. He recommends to mark out the rows from south-east to north-west, at the distance of twelve feet from each other, and then to be crossed again at five or six feet distance, thus leaving the plants at five or six feet distance in the rows.

In the best cultivated vine district in France, they use no other implement in tilling the ground than the hoe. They stir the ground but lightly, lest they should injure or disturb the roots.— This is done twice in the year; first after the Summer training, and again when the leaves fall. They manure every three years, preferring old manure nearly consumed, and of a light warm nature.

Pruning.—Some directions on this subject have been given above, but as the mode of training there spoken of may not always be adopted, we add the following general observations, applicable to all.

The grape vine is never pruned until the second year, when the plant has pushed three or four shoots. Two of these (gene-

rally the lowest) are selected for bearers, and shortened down to the fourth, fifth, or sixth eye from the root, while all others are entirely removed. This is done in the Autumn after vegetation is over, and forms the whole of the first year's pruning. In the subsequent Spring as soon as the buds have pushed, should there be any which if suffered to grow will interfere with the bearing branches, or obstruct the form intended to be given to the vine, rub them off. Suckers are also to be carefully removed.

The third year's pruning will be the result of a careful examination of the vine, and of the wall or trellis you intend to cover. If these be just in proportion to each other, your vine will only need to have dead or diseased branches removed. But if the growth of the shoots be feeble, or if some be feeble and others vigorous, in both cases pruning will be necessary; shortening all in the first case to five or six eyes, and in the other the feeblest only. Future prunings will be but repetitions of this; and as a general rule, every pruning must be followed by a thorough digging of the earth about the roots of the plant.

During the Summer, there are two things to be observed; first, to keep the new shoots as they grow properly tied to the trellis, to prevent their being injured by the winds; and secondly, to pluck off the little side shoots proceeding from the wood, that you are reserving to send out bearers next year. Or perhaps it will be better simply to shorten these side shoots to a single eye. When the grapes attain the size of peas, some shorten the shoots on which they grow to within two eyes of the fruit, with a view to throw more vigour into the fruit.

Diseases.—The grape vine is sometimes subject to injury from the red spider; this insect is expelled but by frequent waterings. Mildew of the grape is said to be remedied by dredging the fruit with flower of sulphur, on its first appearance.

Culture of the Grape Vine in Pots.—Very considerable attention is now being paid, by gardeners in England, to the cultivation of the vine in pots. In some instances, the long cuttings from large vines are curled around the inside of the pot, leaving above the soil but one or two eyes, which in consequence of the numemerous roots that are made, speedily obtain a vigorous growth. By giving the vines a circular training, they will become quite ornamental, and take up but comparatively little space. By putting the pot containing the vine in another, and filling the space between them with soil, a uniform moisture may be easily preserved.

The following is the process as described in the Horticultural Register.

"Put in your cuttings of young wood, in coils of three, four, to five feet, binding all the eyes except the uppermost. I choose

to leave two eyes till the finest gets the lead, and is safe, for fear of accident to one alone; I then slip the weakest off. If placed into a bottom heat, and the eyes be buried an inch or two in the pots, in the course of coiling, by the time the best eye appears above the soil as strong as the bud of a fine asparagus, the whole coils beneath will be completely occupied with young active roots, and by the time the shoots are four feet long, the pot will be a perfect mat of these eager feeders. Then shift and top the shoot, and never leave on any laterals: plunge as before into a fine bottom heat, and encourage the main topmost eye alone to push; and lead it on, but without laterals, till it is again four feet long; when the pot is full of roots, shift, top it as before, and encourage again the uppermost eye only to start; and by the time it is another four feet, if not overpotted before, it will require a third shifting. If required, you may pot at every four feet, five or six times; but three shiftings will be found enough for the season; and you had best not suffer it to reach above from twelve to twenty feet of clear bearing wood. At the end of the season you will have shoots one inch and a half diameter, and with fine bold eyes, and full of fine set bunches for the next season.

"You will readily perceive, that, by such an early and abundant accumulation of young vigorous roots, and by such a top and bottom management, it is no extraordinary miracle to have every cutting a fruit bearing shoot at one season's growth; and by a proportional coil of large older wood, it will be equally obvious to you, how readily such will produce a fine crop the first season."

Wine Making.—Gather your grapes when fully ripe; pick them off the bunches, rejecting all those that are green and unsound; bruise them with a beetle or any other instrument, having a care not to bruise the seed, for if the skin of the grape be but just cracked it is sufficient. Then put them into a cask or hogshead with one head out, and cover it with a blanket and boards to keep out the dirt, &c. Stir them twice or thrice in the first twenty hours, and then let them stand until the colouring matter and pulp (if they have any) are dissolved, which will be in from thirty-six hours to three or four days, according to the weather, which you can see by taking up a handful and examining them: the skins and seeds will have risen to the surface and form a solid body. Then draw off the juice from a hole made within one or two inches of the bottom of your vessel, and barrel it up. But if you have not enough to fill your cask, press the skins and seeds, and put both liquors together, and leave out the bung eight or ten days, filling it twice or three times a day for the impurities to escape at the bung; and then bung it up tight,

and leave a hole for a spile near the bung, which you may draw once in two or three days for a few minutes to let the air generated escape, and in about one month drive it perfectly tight. If your grapes grow on young vines, it may be necessary for the first two or three years, to add from one to two pounds of clean moist sugar, to each gallon, to give it a body and make it ferment freely.

Some time in the month of December following, in a clear, dry, cool day, rack it into a clean sweet cask, well scented with a brimstone match. If it has contained any spirit, except good French brandy, the cask ought to be well scalded to take out any improper flavour. Fill your cask to within an inch of the bung, and then bung it up as tight as possible. If your wine is not fine and bright when you rack it off, it will be best to put some fining into your cask before it is bunged tight. In the month of January or February following, examine your casks again, and if the wine is perfectly fine, rack it again into a well scented cask, and also put a small portion of fining into it, and in the month of March it will be fit to bottle, and in six weeks afterwards it will be fit for use.

In the latter part of the month of May or June following, when the grape vines are in blossom, your wine that is in casks may again go through a slight fermentation, when the bung ought to be loosened for a day or two, and then racked off into a clean well scented cask, or the bung tightened; and if it is drawn off after this slight fermentation has ceased, and if it has got a good body, it is then nearly incorruptible: provided the cask has been seasoned with brandy or some other sound liquor, to extract all the vegetable taste or substance out of the cask.

The foregoing is Mr. Adlum's process for wine making, and is given because of its being simple and requiring no extraordinary apparatus. There are various directions on this subject to be found in different authors, which those who shall undertake the making of wine on a large scale, will doubtless have occasion to consult.

We conclude the subject of the garden with some practical remarks.

The management of a garden (summarily speaking) consists in *attention* and *application*. The first should be of that *wary* and *provident* kind, as not only to do well in the *present*, but for the *future*; and the latter should be of that diligent nature, as (willingly) *never to defer that till to-morrow, which may be done to-day*. Procrastination is of serious consequence to gardening; and neglect of times and seasons will be fruitful of disappointment and complaint. It will often happen, indeed, that a gardener can-

not do what he would, but if he does not do what he can, he will be most justly blamed, and perhaps censured by some more than by himself.

SEED.—Let your seed be such as you would wish to have your future crop: *the best of the kind.* The largest seed of the kind, plump, and sound, is the best, being well ripened and kept from injuries of weather and insects.

Commonly speaking, *new* seed is to be preferred to old, as growing more luxuriantly, and coming up surer and quicker.—As to the age at which seeds may be sown and germinate, *it* is uncertain, and depends much on *how* they are preserved. Seeds of cucumbers, melons, gourds, &c., which have thick horny coverings, and the oil of the seed of a cold nature, will continue good for ten, fifteen, or even twenty years, unless they are kept in a very warm place, which will exhaust the vegetable nutriment in a twelvemonth: (three years for cucumbers, and four for melons, is generally thought to be best, as they shoot less vigorously than newer seeds, and become more fruitful.)

Oily seeds whose coats, though they are not so hard and close as the former, yet abounding with oil of a warmer nature, will continue good three or four years, as radish, turnip, rape, mustard, &c. Seeds of umbelliferous plants, which are for the most part of a warm nature, lose their growing faculty in one, or at most two years, as parsley, carrots, parsnips, &c.

Peas and beans of two years old are by some preferred to new, as not likely to run to straw. Sowings should be generally performed on fresh dug or stirred ground. There is a nutritious moisture in fresh turned-up soil, that causes the seed to swell and germinate quickly, and nourishes it with proper aliment to proceed in its growth with vigour, but which is evaporated soon after from the surface.

Weeding.—Weeding in time is a material thing in culture, and stirring the ground about plants, as also earthing up where necessary, must be attended to. Breaking up the surface will keep the soil in health; for when it lies in a hard-bound state, enriching showers run off, and the salubrious air cannot enter.—Weeds exhaust the strength of the ground, and if they are suffered to seed and sow themselves, may be truly called (as Mr. Evelyn speaks) garden sins. The hand and hoe are the instruments for the purpose.

Digging, where the spade can go between the rows of plants, is a good method of destroying weeds; and as it cuts off the straggling fibres of roots, they strike fresh in numerous new shoots, and are thus strengthened. Deep hoeing is a good practice, as it gives a degree of fertility to the earth.

The thinning of seedling crops (such as are designed to produce seed) is a very necessary thing to be done in time, before the young plants have drawn one another up too much, by which they become weak and out of form, and sometimes never do well afterwards. All plants grow stronger, and ripen their juices better, when the air circulates freely round them, and the sun is not prevented from an immediate influence; an attention to which should be paid from the first appearance of plants breaking ground.

In thinning close crops, as onions, carrots, turnips, &c. be sure they are not left too near; for instead of reaping a great produce, there would surely be a less. When they stand too close, they will make tall and large tops, but are prevented swelling in their roots; better to err on the wide side, for though there are fewer plants they will be finer.

In setting out plants, be sure to do it as early as may be, and always allow room enough for this work; being thus treated, vegetables will come forward sooner, larger, and of a superior flavour. These advantages are seen in all things, but in lettuces particularly, which often have not half the room allowed them they should.

In the choice of seeds, the way to try its goodness, says Mr. Cobbett, is this: "Put a small quantity of it in lukewarm water, and let the water be four or five inches deep. A mug or bason will do, but a large glass tumbler is best, for then you can see to the bottom as well as top.

"Some seeds, such as the cabbage, radish, and turnip, will, if good, go to the bottom at once. Cucumber, melon, lettuce, endive, and many others, require a few minutes. Parsnip and carrot, and all the winged seeds, require to be washed by your fingers in a little water and well wetted before you put them into the glass; and the carrot should be rubbed so as to get off part of the hairs, which would otherwise act as the feathers do to a duck.

"The seed of beet and mangel wurtzel are in a case or shell. The rough things that we sow are not the seeds, but the cases in which the seeds are contained, each case containing from one to five seeds. Therefore the trial by water is not conclusive as to these two seeds, though if the seed be very good it will sink in water, after being in the glass an hour.

"And as it is a matter of such great importance that every seed should grow where the plants stand so far apart, as gaps in roots of beets and mangel wurtzel are so very injurious, the best way is to reject all seed that will not sink, case and all, after being put into warm water and remaining there an hour.

"But seeds of all sorts are sometimes, if not always, part

sound and part unsound; and as the former are not to be rejected on account of the latter, the proportion of each should be ascertained, if a separation be not made. Count then a hundred seeds taken promiscuously, and put them into water as before directed. If fifty sink and fifty swim, half your seed is bad and half good; and so in proportion as to other numbers of sinkers and swimmers.

"There may be plants the sound seeds of which will not sink, but I know of none. If to be found in any instance, they would, I think, be found in those of the tulip tree, the ash, the birch, and parsnip, all of which are furnished with so large a portion of wing. Yet all these, if sound, will sink, if put into warm water, with the wet worked a little into the wings first. I incline to the opinion, that we should try seeds as our ancestors tried witches: not by fire but by water; and that following up their practice we should reprobate and destroy all that do not readily sink."

CHAPTER III.

THE DAIRY.

A dairy is a place where milk is kept, (which should be carried there as soon as taken from the cow;) butter and cheese are likewise made in it.

Unquestionably the qualities of these products result, in a great measure, from the care which is taken with the milk; the preservation of which, depending solely upon the place where it is kept—the location and establishment of a dairy are, therefore, two very important points.

Judging by the majority of establishments of this kind among the farm and country houses, the dairy appears to be an object of indifference;—this negligence brings with it the greatest inconveniences, and the loss resulting from it greatly exceeds the expense necessary to fit these establishments for accomplishing the purpose designed.

In pointing out the considerations which should guide the location and arrangement of a dairy, we may perhaps awaken some reflections in those whom such a forgetfulness of their interest, too frequently keeps in a continual state of trouble.

It is a well known fact, that the most highly valued butter and cheese are made in those parts of the country where the dairy is the object of the greatest care.

We do not, however, intend to give here a plan for the construction of a dairy indispensably necessary to be followed.—Whether it be established in the buildings adjoining the farm-house, as is the case in highly cultivated lands—or placed in the barn-yard of country seats—or lastly, whether under an elegant form it becomes one of the ornaments of a park, is of no importance, provided attention is paid to our future observations. We may say that luxury adds nothing to its qualities—the only one indispensable is the most minute cleanliness.

The dairy should be located in a quiet place, apart from any business which might cause any concussion, especially from col-

lections of filth or dirt, and generally from any thing which would infect the air with fermentable miasma.

It should be, as much as possible, protected from the changes of the atmosphere, which have so marked an influence upon the milk. The temperature should be in all seasons between 8 and 10 of Reaumur (45 Fahr.), this being most favourable for the rising of the cream. If kept at a lower degree, it rises less quickly; if higher, the milk curdles, before you have time to separate the cream, which thereby contracts a sourish taste. In order that a dairy may always maintain this temperature, it should be a little subterranean and vaulted. This arrangement is most generally adopted in good dairies. It should be in a northern exposure.

The size of this establishment depends in a great measure upon the kind or manner of farming. In a country house, for example, a dairy of eight or ten feet wide, by fifteen or twenty long, is sufficiently large. But when the dairy is made an object of speculation, the arrangement should then conform to the produce to be manufactured in it.

This leads us to consider the establishment of a dairy in three principal respects, viz. for the preservation of milk intended to be sold, for the making of butter, and of cheese.

A dairy designed for a store-room for milk to be sold, does not require so much care in its construction—the milk remaining in it but a short time. It is rarely vaulted; it is sufficient to be cool enough in Summer, to preserve the milk until it is sold. It is generally a room placed near the stables or in the side wing of the house; it should always have a northern exposure, and adjoining a vestibule or small room appropriated to the utensils which are unemployed; and provided with a boiler and furnace for heating the water to wash them.

However, whenever the locality will permit, this room should be a little apart from that where the milk is kept, so that, in Summer, the heat of the furnace may not injure the milk. The milk room is furnished with tables, placed against the wall, to hold the vessels containing the milk; it is generally about nine or ten feet wide within the clear, leaving between the tables sufficient room for use; its length depends upon the extent of the dairy.

A dairy used exclusively for making cheese should be composed of at least three parts. The first is the dairy, or more properly speaking milk-room. The width we have previously mentioned—the length varies in the same way. It is most generally vaulted.

The curve of the arch begins about four feet from the ground—so that its height under the key stone should be from eight to nine feet. The walls should be carefully rough cast and kept in

good order, that no rubbish may fall from it—and they are white-washed with lime. If the dairy adjoins no other building, and is but one story high, it is best to have it thatched or reeded quite thickly, and so as to lap over the sides. You may, in this case, fix a stove tube projecting one or two feet, to serve when needed as a ventilator.

Tables are arranged round the sides of the room; elevated about two feet and a half, they are supported by brick or iron props; and when possible, by pillars of hard free-stone, which are best, as they are kept clean more easily. These tables should be of oak, and four inches thick; the outer surface is cut in longitudinal and parallel grooves, and slanted a little, to allow the whey from the cheese and the water to run off.

When it can be done, these tables are made of hard stone; in expensive dairies they are made of marble. But, although these materials are preferable to oak, as they do not contract a sour taste, washing them should not be neglected, and should be done every day thoroughly, because the whey which remains upon it has a corroding effect which impairs them after a while.—Above the tables are placed oaken shelves: they contain the utensils of the dairy, and the dry cheeses.

To be more solid, the floor should be made of stone flags, placed upon cement, and joined with mastic (or putty.) A double brick pavement upon mortar will however answer; it should be constructed with a proper slope to let the water run off; the duct is closed upon the outside, by an iron-wire grate, which is sufficiently close and strong to prevent any little gnawing worms from passing.

Water being daily necessary, a reservoir should be established near the dairy; if it could be contiguous to it, so that the water might be conveyed into it by means of pipes, with spigots inside, it would be a great saving of time. In this case the reservoir should be placed in such a manner that the sun could not reach it, and thus preserve the water cool.

The door should shut hermetically; towards the top a sufficiently large opening is contrived—which is closed in Winter by a shutter; and in Summer a frame is fixed upon it, and to which should be nailed a fine lattice-work, or rather a metallic cloth, to keep out the flies; outside of this lattice is placed a grating of iron netting, fine enough to protect it from the cats, rats, &c.

The aperture for the windows—fortified with iron bars, should be closed in Winter by glazed sashes, or by shutters, and in Summer by frames covered with a lattice like that of which we have just spoken; both should be perfectly closed. By means of this latticed frame, a cooling current of air can be obtained in Summer, which drives away all offensive smell.

The greatest cleanliness should be observed in a dairy. The milk should be washed up very carefully—wherever it has fallen—before it sours. No spider's webs, nor dirt of any kind should be allowed; in Summer, particularly, the floor should be often washed; this should not however be repeated so often as to produce a constant moisture, which would communicate to the milk a mouldy taste. Wooden soled shoes, kept perfectly clean, should be always at the door of the dairy for the use of those who enter it; that they may not bring in any dirt upon their feet.

The second room, which forms the vestibule, is exposed to the south, and protects the dairy from the heat of Summer. Shelves and brackets are placed all around to hold the utensils, which are dried there. It should also contain a boiler upon a furnace, which will serve, as we have before said, to heat the water for washing.

The third room is the cheese room.—A dairy intended for the manufacture of butter should have three rooms, like the cheese dairy—the third room containing the churn. If cleanliness is essential in a dairy where cheese is made, it is indispensable here. The least negligence in this respect produces serious injury.—Every one knows with what facility milk is penetrated by the odours which surround it, and what a pernicious effect these may produce.

Utensils for Milk.—In this class of utensils are comprised those necessary for milking, straining, and transportation of milk. Light white wooden piggins, well hooped, are most commonly used for milking; they have one stave longer than the others, and pierced by a hole at the top, to pass the hand through to carry the pail. It should be deeper than it is wide, and smaller at the bottom than at the top.

Some persons use copper buckets. Although the short time the milk remains in the pails, especially as it does not become cold, may not allow the formation of any unwholesome combination, yet the use of wooden pails is preferable, as the slightest neglect might occasion accidents with the copper.

The milk is strained through a hair sieve to separate from it all hair and dirt. In some provinces, a cullender is substituted for the sieve; its form is that of a bowl without a bottom; the material is common clay or wood; to strain the milk, they place upon this a white linen perfectly dry. This answers very well; and is preferable to the sieve, because the hair of that article gets broken in a few days, whilst the linen of the strainer can be taken off every time and washed separately. The vessels for containing the milk vary in form according to its destination. We shall presently mention those used for making butter.

The vessels destined for the transportation of milk should be of tin, since wise regulations have prohibited as dangerous the use of copper utensils. This prohibition has met with great opposition from dairy-women, who have remarked that milk keeps better in copper. This fact, justified by the experience of Cadet Devaux, is also, according to him, a reason for excluding it, since this preserving quality only proves the dissolution of a portion of the metal, and it is known what danger is incurred from copper dissolved by a greasy substance. The vessels are higher than they are large, and smaller at the top than at the bottom. This form delays the rising of the cream, and consequently preserves the milk longer in its homogenity. It is still more essential that these vessels should be of an unalterable substance, as generally, in order to hasten the departure the next morning, the milk is turned into them the evening preceding, and consequently remains there all night.

Although this custom is not universal, it is urgent to destroy it, as it is a bad one. The milk, being in repose during the night, decomposes, or at least its essential parts separate, and the cream rises upon the surface of the liquid. To obviate as much as possible this inconvenience, the milk destined for daily sale should be left in the evening in ordinary pots, and in the morning well stirred up to mingle it; after which it may be turned into the proper vessels.

Utensils for Butter.—The same utensils are needed for making butter that we have just mentioned, with the exception of those of tin; beside these are requisite, some for the rising of the cream, and others for churning the butter. The vessels, most favourable for the rising of the cream, are those which are small at bottom and widening towards the top. The proportions generally adopted in the best kept dairies, are about fifteen inches in diameter at the top, and six at the bottom, and the same in height. These proportions are the most favourable for the slow and gradual cooling of the milk, and for the complete separation of the cream, which gathers easily at the surface. If in too large a vessel, and in one with much depth, the cream being only a simple pellicle dries quickly, and acquires a sharpness, because it offers too large a surface to the air. These pans should be of free-stone, and not of glazed earth. The varnish employed for earthenware does not possess sufficient insolubility to use these vases with security. The pans should have a spout for the milk to run out. Some are perforated at the bottom. The hole is closed when the milk is turned into the pan, and unclosed when it is to be turned off and separated from the cream.—We should, however, recommend in preference, the use of pans with a spout, because they are more convenient, and the cork

used for the others might communicate a bad taste, unless it should be often renewed and kept very clean.

When the cream has risen, it is taken off with a skimmer, which is moved carefully over the surface of thé milk. Some persons wait until the milk is curdled, before they take off the cream; but it should be remembered that the constituent parts of milk separate easily when in a state of repose, and change quickly. The wisest plan, is to work with the greatest celerity, so as to avoid the fermentation and decomposition of the parts which are to be preserved; thus directly after the cream has completely risen, it should be taken off, and it will be all the better for it. There should be also pans to hold the cream until it is ready to be churned.

The implements for making butter vary, as do all others, according to the country, and the necessity of making a greater or less quantity. In country houses, as well as in small dairies, the churn is generally adopted. This is composed of two parts.—One is the churn properly so called. It is a kind of truncated cone, made with staves; it is smaller at the top than at the bottom. Intended to receive the cream which is to be churned, it generally has four hoops, at the bottom, the middle, and the top. Flat ones are generally preferred to the half round ones employed for hooping casks—as they last a longer time, and are more easily kept clean, while the first retains the drops of cream, and contracts consequently a sour taste, which it is difficult to remove, and taints the churn. It has a lid which closes tightly but is moveable. This lid is pierced in the middle with a round hole, for the dasher to pass through. This is the second part: it is composed of a stick, at the end of which is fixed a small piece of wood, pierced with many holes, and of smaller diameter than the entrance of the churn. The stick or handle is long enough to touch the bottom of the churn while it passes through the lid.

In large farms, the quantity of butter made is so great that the churn is not used. Instead, what is called a "serene" is used. This is a large cask, hooped with wood or with copper (red.)—Its dimensions vary; with one, three feet long by two and a half in diameter, a hundred pounds of butter can be made at once.—The cask is placed upon a horse, and of a convenient height to turn it easily. It turns by means of a pivot and winch, fixed in the horse on one end and the other opposite, by iron crosses: these are fastened upon the stand or horse, that the axle-tree may not pass through the cask, in the interior of which iron should not be admitted. When the "serene" is large, it has two winches, one at each end, that it may be turned by several persons.

In the inside of the "serene" are two shelves, about four inches large, and which are fastened to the staves of the barrel; they are ranged from one end of the barrel to the other, and are sloped at the end, to let the milk run off. In the middle of the barrel is an opening of six inches: this serves to pour in the cream, and take out the butter. It is closed by a stopper covered with white linen, which is fixed down tight by an iron plug.—There is another hole on the opposite side, about an inch in size, closed by a stopper; this serves to let the buttermilk run out, when the churning is finished, and to introduce fresh water.

In the large farms of Holland, of Flanders, and of Switzerland, where they make a great quantity of butter, they use another kind of "serene" differing from this in having the barrel immoveable, the cream being agitated by wooden flies, set in motion by an axle-tree, which runs through it, and to which is fixed a winch; this is the best method. The barrel may be of any size: it is placed upon a solid stand, that it may not move when the winch is turning. This is set into the axle-tree of a hand-mill of four wings, which touch within an inch the staves of the barrel; this axle-tree bears against the stave in the centre of the side opposite the winch, and enters into a bracket which prevent its getting disarranged. This barrel has, as well as the other "serene," an aperture for the introduction of the cream, and one to turn in the water.

Still another "serene" is made use of, similar to the first of which we have spoken—but without winch or pivot. It is fastened upon a curved stand, like the rockers of a cradle; and the butter is churned by moving it backwards and forwards. It does not appear that the form of the articles in which butter is made has any influence upon its quality, which depends, as we have before said, upon their cleanliness and upon the cream.—The English, who instead of a round cask make it in a square box, obtain it quite as easily as in any way we have described.—Consequently, when choosing a churn, the preference should be given to that which works the quickest, is the most convenient, and most easily taken care of.

The vertical churn, which we described the first, is sufficient when but little butter is required—but its operation is long and fatiguing. It is true it can be rendered less so: different means have been contrived for this, and are employed in some countries. Sometimes, it is an elastic perch, fastened to the staves, which facilitates the motion of the dasher. Sometimes, also, it is merely an axle-tree and winch, with a wing; or it is set in motion by machinery like that of a roasting-jack; they likewise adapt to it a tambour-wheel, in which they place a dog, trained for that purpose; this is the custom in Languedoc and Provence.

In our opinion, the "serene" without an interior *agitater*, is the most favourable. The operation of it is not laborious; and it is easy to keep it in a proper state of cleanliness, an advantage which those with a handmill do not possess. When it is made large, machinery can be adapted to it, to obviate the necessity of employing many persons to turn it. If water is at disposal, it can be used beneficially for this purpose.

When the butter is made, it has yet another operation to undergo—that of washing; they knead the butter, in its whey.—When it is well consolidated, and has no lumps, and appears quite rich, they wash it in several waters, until the last pours off quite clear.

All the utensils of a dairy should, as soon as they have been used, be put into boiling lye and water; afterwards rinsed in fresh water, and rubbed with a brush, or wisp of straw, or greek nettles; afterwards dried in the sun, or by the fire. Too much care cannot be taken to keep them very clean, because the least particle of old milk adhering to them, becomes a leaven of decomposition for the new milk. Whenever the churn is used it should be washed in boiling water, first; afterwards many times in cold water; then rubbed with a wisp of straw, inside and out; afterwards rinsed plentifully, drained, and dried. Some persons wash it first in whey, and then with fresh water.

We have already said how necessary cleanliness is in a dairy; it is especially so with the utensils which come in immediate contact with the milk.

Making Butter.—As soon as the milk is taken from the cow, it is carried in wooden pails to the dairy, (which should possess all the qualities which we have previously mentioned;) it is there poured into earthen pans, placed for that purpose. These pans are first carefully washed and dried: any negligence in this respect injuries the delicacy of the butter. The pans are placed upon the floor of the dairy.

To render the separation of the cream easy, three things are requisite: the milk should present a large surface—it should be in a state of perfect repose—and it should be subjected to a temperature of 8 or 10 deg. Reaumur (54 or 56 Fahrenheit.) In a dairy where the temperature is always the same, you can skim only every twenty-four hours; but not later, as the cream would lose its sweetness. The milk of one milking should all be skimmed at the same time; and when the season obliges you to milk the cows three times a day, you should skim three times the next day, at corresponding hours.

When the dairy is susceptible to the changes of the weather, still greater watchfulness is necessary. The pans being shallow,

the cream rises less or more quickly, according to the temperature; the milk then must sometimes be skimmed every 18 or 20 hours; sometimes every 12 hours answers. In Summer, you should only skim when the milk is curdled, otherwise much of the cream is lost;—but you should be careful that the whey does not rise to the surface. When the weather is hot or stormy, the dairy must be cooled—for this purpose it should be watered; and to preserve the coolness a long time, the floor should be sprinkled with salt; this causes the evaporation to last, and the dairy dries less quickly.

If then the cream has sufficiently risen, it must be taken off. Generally, the difficulty is to know the precise moment to skim; if done too soon, you necessarily lose some of the cream, as it has not entirely risen; when too late, it has contracted a strong flavour, which it communicates to the butter. In guiding yourself by the observations which we are going to make, you will almost always succeed. Always be careful before skimming, to place your finger upon the cream; if it resist, and your finger is not moistened, then is the favorable moment. To *skim*, they raise the pan gently, place the spout upon a pitcher, open the cream at the spout with the finger, and let the milk run off, leaving the cream alone. When the pans used are perforated at the bottom, the opening is unclosed, and the milk runs off in that way; but we have already said, the use of these pans was inconvenient.—Skimming thus by pouring out, and taking care to choose the favourable moment, the cream is sweet, since the milk leaves it liquid, and you have not to fear that it will contract a sourness, since this fluid has left it.

This is not so when this operation is neglected. At first the milk, placed in large earthen pans, is in too large a mass to be cooled or freshened, and the cream is long enough in rising to let it curdle. Cream which remains too long a time upon turned milk contracts a sourness; beside this it brings with it another inconvenience. However delicately you may take off the cream with a skimmer, this article will always waste some of the cream. The cream is all collected in widened earthen pans, which are not covered, and is thus preserved, until it is to be churned; sometimes four or five days, and sometimes longer, until there is sufficient. Experience teaches, however, that the shorter time it is kept the better the butter is. In the environs of Rennes, where it has a great reputation, they churn it every day in Summer, and even in Winter, and it is the only way to have excellent butter.

As soon as the cream is taken off, all the skimmed milk is taken from the dairy, lest the odour it exhales should injure the preservation of the new milk which is placed there. The skim

milk will make common cheese; or it may be employed in the interior of the farm, either for the domestics and workmen, or for the nourishment of the cattle.

We have already said, and we will here repeat, that the vessels in which butter is made, do not appear to have any influence upon its goodness. It is not difficult to prove this. Cream shaken in a bottle for some moments, produces butter quickly; beaten with a handful of twigs has the same effect. We can say only that it is essential that it should be churned without interruption, and that the motion which is used, should be equal and moderate; otherwise it becomes heated and contracts a strong taste; the vessel in which it is made, should be but half full. When it is made in a churn (baratte), they by filling it half full with the cream, then shutting the cover, and raising and lowering the dashing, form the butter.

When the "serene" is used, the cream is introduced by the large opening, which is afterwards hermetically closed—then the "serene" is turned until the butter is made; this operation requires half an hour in Spring and Autumn, and many hours in Winter. The butter at this season, takes a long time to separate; they are sometimes obliged to heat the mass of cream: many means are employed for this. Dairy-women envelope that "baratte" "serene" in linen heated by the fire, others turn upon the cream a certain quantity of hot milk. It is better to keep the temperature of the room where the butter is made at a proper heat [12 to 13 deg. Reaumur,] for all the other modes of acceleration succeed only at the expense of the delicacy of the butter. In Summer, on the contrary, it often forms too rapidly—then means are sought to cool the cream. The best is to move the churn slowly, and to choose the coolest time of day and place, such as the cellar.

The labour which the making of butter requires is quite fatiguing; we have previously said, that when a quantity is made, the labour is diminished by peculiar machinery, depending partly upon different localities.

The butter is formed when it falls in lumps or in a mass. It is then taken from the churn and thrown into fresh water, where it is freed from the milk by kneading it well, and renewing the water, until it runs perfectly clear: it must not be left in the water, for it would become white there. Afterwards it is formed into lumps of greater or less weight, according to custom, and enveloped in linen bleached expressly. We may here observe, that the largest lumps are the most esteemed, because butter keeps better in a mass. These lumps are marked with a spoon or figured stamps, according to the taste of the butter-women.

It is well known that butter is yellow in Summer, and that it

wants this colour during the bad season. There are always exceptions to this general rule, for some cows, and notoriously those of Prevalaye, furnish it yellow constantly. Some economists attribute the cause of it to the use of good hay, dried roots, and *warm* drink. White butter is considered, and very rightly, in commerce, as less good than yellow; this last is always the result of good pasturage and dry substantial forage, whilst white butter comes from milk produced by bad food.

A method has been found to give it this yellow colour, without injuring its goodness or altering it in any thing. For this purpose single and double marigold flowers are used, they are equally good when they are gathered fresh. A certain quantity of them are procured, and heaped in a free-stone pot; the pot well closed is placed in the cellar. After some months, the flowers are converted into a thick liquor which preserves their colour; this liquor answers to colour the butter during the Winter. To do this, a portion of it is poured into the cream, and mixed with it in the churn. Experience teaches the proper quantity. This colour is durable, and is not troublesome; the flowers which produce it are cordial and sudorific, and besides so few are used that they are not perceptible.

Other colouring matters may attain the same end, and are employed in some countries; such as saffron flowers, alkenge berries [winter or morel cherry,] and the roncon or annatto boiled in water. Parmentier advises the juice of the yellow carrot; he appears to think that this juice in mingling with the butter, would facilitate its separation from the milk, and would help to keep it.

With the exception of wood moistened with buttermilk, butter attaches itself not only to every thing which is not clean, but also to every thing that is washed well, and scalded in boiling water; but it will not adhere to objects cleaned with a lye made of fine ashes, or rubbed with the Roman nettle, macerated so that they will not prick; this last is likewise used to clean the vessels which have been used for the milk, cream or butter; they are, too, sometimes washed with lye. The mistress, who commonly takes care of the management of the butter, to draw it from the churn, and form it into lumps, is obliged to rub her hands and arms with it—otherwise the butter would adhere to them.

Butter, possessing different qualities, according to the season and the cases which its preparation demands, forms a product necessarily varying. Whilst active and intelligent dairy-women, send into market delicate and fresh butter, those who are confused by the routine, and whom idleness or badly managed occupations cause to churn only once in eight days, sell only strong and rancid butter. The low price which they receive, discoura-

ges them, and causes them to neglect still more this resource, which a little care and zeal would render so productive.

Fresh butter is distinguished by a mild and agreeable flavor; the less it is washed the more delicate and fine it is. But in this case, its delicacy exists no longer than from one day to the next, particularly during great heat. This delicacy is owing to the milk which remains with it, and it is that which prevents the butter from keeping, by communicating to it a sharp sour taste. Thus you cannot dispense with well freeing the butter from milk, excepting when it is to be used immediately. That which is intended for keeping cannot be too carefully attended to in this respect. To procure butter of an exquisite flavour and extreme delicacy, it must be washed, finally, with new milk; the cream of this new milk is incorporated with the butter, and communicates to its sweetness and delicacy.

To preserve it in its fresh state, as long as possible, it must after it has been well washed and no more milk remains in it, be heaped into a pot, in such a way that no air can enter, and kept under fresh water which must be frequently renewed—especially when the weather is warm. It may also be kept, wrapped up in bleached linen, soaked in fresh water; but this linen must be always moist. The water, in swelling the threads of the linen, protects the butter from the air, and in evaporating repels it still more, and maintains at the same time a salutary coolness.

We may here observe, that no substance becomes more impregnated with surrounding odours than butter; and those who think to withdraw it from the effects of the heat by keeping it in the cellar, expose it to contract a very disagreeable flavour. If the cream is not taken from the milk in time, the consequence will be a rancid taste in the butter. That which has not been well freed from the milk contracts it also as soon, and owes it, as we have said, to the buttermilk, which contains more or less of a cheesy substance.

It is really too difficult to conceive how any one can be so obstinate, as to allow cream intended for butter, to remain many days upon the milk; for if the two comparative experiments were only tried, the difference between butter made with new cream and with old, would be very perceptible. It is equally wrong to think that the first requires more care than the last—this assertion has only been made through idleness, and has no foundation. However, to ameliorate as much as possible the rancid taste which cream long kept contracts, add to it when it is to be churned more or less milk, just taken from the cow. This simple method has a good effect.

Finally, when butter has acquired a rancid taste, which renders it unsaleable, there is nothing else to be done but to melt it.

Preserving Butter.—The butter of the early part of the season, is not so proper for salting for preservation, as that made in the latter part. Perhaps the best is from the middle of August to the end of October. When the butter comes from the churn, put it into a clean wooden bowl, and with a wooden butter ladle proceed to work it, by breaking down at the sides, and turning off the whey which is separated in the process; at the same time strew on the salt by degrees so that it becomes ultimately incorporated. Continue working it thus until the butter-milk is apparently worked out. Put it then by in a cold place until the next morning, by which time the salt will be dissolved, when the ladle is to be again applied, and continued as long as any butter-milk can be separated. The butter is then fit for use or laying down. For preserving, except for transportation, stone-ware jars are preferable, as they impart no taste to the butter and exclude the air. Pack down the butter without any salt between the layers, and cover with two inches of strong brine, previously boiled, skimmed, and suffered to become cold. If a scum should afterwards appear on the brine, which will sometimes happen in damp cellars, renew the pickle; or instead of the brine lay a thin bed of salt in the pot or barrel before the butter is put in, and another over the top, when it is finished.

MAKING CHEESE.—*Cheeses* were known among the ancients —but no trace remains of the manner of their making them.

It is generally thought that the quality of the fodder influences very perceptibly that of the cheese. There is no doubt that the food gives to the milk a greater or less abundance of constitutive elements: but there is likewise no doubt that care, cleanliness, and the manner of making the cheese, contributes still more to it. We see some dairy-women obtain cheeses of a better quality, than others, whose cows nevertheless graze in the same pastures. This is a useful fact to be known—because upon it depends the improvement of many of our cheeses, which will remain inferior as long as the cheese-makers, persuaded that their defects proceed from the fodder—obstinately will not perceive the faults of their processes. We have shown the composition of milk, and said how the butter is extracted from it.—Cheese does not, in a less degree exist in it, since it is composed of the cheesy part, which it is only necessary to free from the whey, in which it floats. In milk left to itself this part separates, and thus naturally forms the cheese. But when this effect takes place spontaneously, it contracts a sour or sharp taste, injurious to it, excepting when it is to be eaten immediately, particularly in Summer, when this acidity is pleasant and stimulating; but when it is to be kept, the milk should be artificially curdled; finally

the qualities of this alimentary substance, depending upon the means employed, the art of manufacturing it exacts particular care and precaution.

Generally, Summer is the season chosen to make cheese; food is then more abundant, and consequently milk; at this time it curdles more easily and more thoroughly, and the cheese made from it, has time to acquire, by Winter, the qualities which render it excellent.

Cheeses are made with pure cream; with milk as it is drawn from the cow; with that to which a portion of cream is added, and finally with skim milk. Of course all these cheeses possess different qualities according to the proportion of their elements; but the manner of manufacturing them produces a still greater difference: thus a prodigious number of cheeses are made, although only with the milk of cows, goats, sheep, and sometimes a mixture of these three.

Before describing the means adapted for curdling the milk, and which are used for all cheeses, we may say, that generally a multiplicity of circumstances, which it is difficult to define and to understand, exert so great an influence in the manufacture of cheeses, as to produce perceptible difference in those even made in the same place, of the same milk, the same pressure, in the same day, and by the same person.

The causes which produce them can only be pointed out; but it is difficult to remedy them, because they often escape the eyes of those most accustomed to the business.

It is known that one cow will produce milk differing from that of another in proportion to the constituent elements, and that this same proportion varies itself every day, according to the age and the state of the health of the animal, the cold or heat, the air which it has breathed, and the nourishment it has taken.

Consequently, the mixture of these different milks will only cause the mass to experience the different modifications. Finally, the state of the atmosphere, the good or bad exhalations which charge the air of the dairy; the size, arrangement, dryness or moisture of the dairy, the nature, form, and capaciousness of the utensils employed; the newness or oldness of the rennet, its greater or less strength, and the quantity which is always uncertain; lastly, the different processes to which the curd is subjected to obtain from it cheese; the places in which it is deposited, are so many circumstances which favour or hinder the perfection of cheese.

The means employed to curdle the milk.—A great number of substances possess this property. We may cite among the vegetable, flowers of the two kinds of "*gailium*," ("lady's bed-straw,") the yellow and white, and those of the thistle, artichoke, &c.;

vegetable acids and cream of tartar produce this effect likewise, but are not used for the object, which now occupies us. There are also mineral acids, but the use of them is dangerous.

Most ordinarily, to attain this object, the liquor contained in the stomach of calves called rennet, is used. Lambs and kids equally furnish this, provided they are killed, as well as the calves, before they have taken any nourishment but their mother's milk.

The mode of preparing this, most generally adopted, consists in opening the ventricle or lower stomach of the calves. It is freed from the clots of blood, washed, wiped with a clean linen, salted and put back into the rennet-bag, which is hung up to dry it. The use of the rennet thns prepared, varies in every place where cheese is made. Some cut off a piece of it, which they mix in a little milk or a little water, others merely rub with it a skimmer or wooden spoon, which they afterwards dip into, and stir the whole mass of milk. Some persons add to it vinous or acid liquors; lastly, there are some who soak the rennet-bag in a certain quantity of water, either cold or boiling, leave it there awhile, and employ this infusion.

The following is very nearly the manner in which the rennet is prepared, which is used for the Cheshire cheese, so famous in England.

The fresh rennet-bag or ventricle is cleaned from all the impurities it may contain, by washing and wiping it. It is then almost entirely filled with salt; afterwards a bed or layer of this latter is made in a pot large enough to contain three rennet-bags, placed flat one above the other, above each a layer of salt, and continued in this way until the pot is sufficiently full. The last upper layer should be of salt. The pot is covered with a plate or piece of slate, and put in a cool place.

When it is time to use them, all the rennet-bags are taken out at once, drained, laid upon a table, and sprinkled with fine salt, on each side, then passed over with the rolling pin, to cause them to be penetrated with the salt; lastly, they are hung up to dry, unfolding each bag, and keeping it open by means of a little stick.

When they are sufficiently dry, they are placed in a vessel either large or small, and three pints of water poured into each rennet bag. After twenty-four hours' time, they are drawn out and put into another vessel, and only one pint of water to each bag poured in. They remain in this twenty-four hours, and then are taken out, stirring them first gently in the infusion.

The two infusions are mixed and strained through a sieve of fine cloth. Sufficient salt is added, to prevent the liquor from dissolving entirely, and for some to settle at the bottom of the

vessel. Care should be taken, every day in Summer to take off the scum which forms, and add to it from time to time a little salt, that there may be constantly a plenty of it. This liquor is used in the proportion of a one hundred and twentieth part to the milk to curdle.

Whatever method may be used for the employment of the rennet, as regards the rest, it always produces the desired effect; but it is not sufficient to separate the whey from the curd, but the latter must preserve that adherence and richness which constitutes the quality of cheeses.

We believe the infusion of rennet to be the best, as it mingles with every particle and does not speck the curd, excepting always when the dry rennet is used by mixing in a little milk, at the moment it is wanted, and wrapping the whole in a bag or knot of linen.

It would be difficult to determine the precise quantity of rennet to be used, because it depends upon its strength, upon the qualities of the milk, upon the season, the state of the atmosphere, and lastly, the kind of cheese to be made. We will content ourselves with making here some general observations.

Strong smelling rennet should not be used, because it communicates to the curd a bad taste.

Milk curdles more easily in Summer than in Winter; the quantity of rennet should be less in the former season than in the latter. Skim milk curdles more easily than that which has preserved the cream: the fatter it is, the more rennet it requires.—Heated milk also favours the action of the rennet.

Too much rennet is injurious, because the curd forms in adhesive clots, and lets the cream run off with the whey: cheeses made from this are dry and brittle. Too little rennet is equally prejudicial; the milk takes a long time to curdle; the whey is drained off with more difficulty, and may, by remaining with it, communicate to the curd a disagreeable sour taste.

It is, then, the proportion, which the dairy-women should strive to find out—practice and experience will be in this case, the safest and surest guide.

Quality of the Milk.—It is obvious that on the quality of the milk the goodness of the cheese, with common management, must in a great measure depend. The quantity of cream that is used is generally in practice different, according as they are *one-meal* or *two-meal* cheeses.

In Cheshire "the general custom, however, in the best dairies, is to take about a pint of cream, when two-meal cheeses are made, from the night's milk of twenty cows.—In order to make cheese of the best quality, and in the greatest abundance, it is admitted that the cream should remain in the milk; but whether

the cream that is once separated from it can by any means be again so intimately united with it as not to undergo a decomposition in the after-process, admits of some doubt. There is, at least, no absurdity in attempting to prevent the separation of two bodies, which it is the professed intention to unite again. If a cheese made entirely of the night's milk on which the cream has risen be as rich as one made of new milk, all other circumstances being alike, it is a proof that milk and cream after being separated may, by heating alone, become as it were new milk again. Experiment alone can decide this point: but the practice here is to unite the milk and cream, as will be shown hereafter; and the dairy-men say, that when so united it differs not from new milk as to the purposes of cheese-making."

If the whole milking be directly made use of in its simple state for the cheese, it is denominated a *one-meal* cheese; but where two milkings are blended, or *two-meal* cheese made, the quality of the milk used differs considerably: in some cases the whole of the cream of the first meal is abstracted, and in all cases a certain portion. In some dairies the milk of the first meal is set in the leads or other vessels as usual; and as it is the evening's milk that is in common added to the suceeding morning's, the operation of cheese-making begins immediately after that of the morning milking is completed, at about five or six o'clock. The cream of the evening milk being skimmed off, the milk is carried and put into the chese-tub, reserving sometimes a half, sometimes a third, but more frequently only three or four gallons to be applied as below. The milk reserved, in any of these proportions, after being put into a brass pan and made scalding hot, by placing the pan on a furnace or in a vessel of hot water, is one half of it poured into the cheese-tub among the cold milk, and the other into the pan in which the cream had been put. The cream and the hot milk being intimately incorporated, the whole is poured into the cheese-tub, which by this time has received a great addition, if not the whole of the morning's milk warm from the cows. Thus the different meals' milk form, as it were, a fluid of the same nature, equal in quality and temperature, and to which the rennet is applied in the usual manner. This re-union, or in the dairy phrase, *melting the cream*, is probably the best method practised; but it is, we believe, not so effectual in forming cheese of the best quality as that where the milk is entirely new.

In making *skim-milk cheeses*, the milk is set in the leads or pans as usual, in which state it remains longer or shorter, according to the weather, care being taken to skim off the cream, or to drain off the milk, in proper time, before it begins to acquire a sourish taste. If that should at any time happen, either

from the excessive heat of the weather, or owing to some inattention in the general management, in place of putting the skim-milk upon the furnace to give it that degree of heat supposed to be necessary for facilitating the coagulation after the rennet is applied, and which is the usual practice, the method is, to put it directly into the cheese-tub, and to pour in such a quantity of hot water as will give the wished-for temperature. By this means, the risk of the milk breaking while heating on the furnace, which when not quite sweet and fresh it is apt to do, is avoided without inconvenience in other respects. In this sort of milk it is necessary to add somewhat more rennet than is usually applied to a similar quantity of milk, which contains either the whole or a great portion of the cream.

Colouring.—From the practice of colouring cheese having been so long common in the cheese districts, it is probable that those of the best quality would be in a great measure unsaleable if they did not possess the requisite colour. The degree of colour is regulated chiefly by the name under which it is intended the cheese should be sold. The introduction of this practice originated in the intention of conveying an idea of richness; but the leanest cheese always requires the greatest quantity of colour to bring it to the proper appearance. The material which is usually employed for this purpose is Spanish Arnetta. The weight of a guinea and a half of it is considered in Cheshire sufficient for a cheese of sixty pounds; and in Gloucestershire an ounce is the common allowance to an hundred weight. There are different ways of preparing as well as of applying it. The method used in Cheshire is, when the dye is wanted in the morning, to tie up the necessary quantity of pounded arnetta in a linen rag, and to put it into about half a pint of warm water in the preceding evening. In the morning, immediately before applying the rennet, the infusion of arnetta is poured into the milk, and the mixture is then well stirred about, so as to make the milk and the dye incorporate intimately together. In other districts it is common to rub a piece of unpounded arnetta, after having been previously dipped in milk, on a smooth stone, in the same manner that paint is ground. The colouring thus obtained is mixed with the milk in the cheese-tub, in the manner and at the period before mentioned, care being taken to prevent any of the unreduced particles of arnetta from falling into it.

Setting the Curd.—The degree of temperature which milk ought to possess, so as to be in the best possible condition for applying the rennet, is by no means fully decided. It is, however, admitted that the quantity and quality, or texture of the curd, depend much on the length of time the curd is in forming, and that on the quantity and strength of the coagulum employed,

and state of the atmosphere, and the heat of the milk at the period of its being mixed. In this matter the practice of almost every particular dairy differs from that of another. That which is adopted in Cheshire, is, that the lowest degree of heat which milk ought to possess when the rennet is applied, is one half of that of the milk from the cow; the highest about twice the natural warmth. From this it is inferred, "that by the time a large dairy of cows can be milked, and the milk be put together for the purpose of artificial coagulation, the dairy-maid will not err materially by applying the rennet immediately afterwards." This rule is however very uncertain, and liable to exception, on account of the variations in the season, and the frequent and great changes that take place in the state of the weather in the same season. Accordingly, in all dairies remarkable for cheese of a superior quality, the heat of the milk, before the rennet is applied, is raised or lowered by the addition of warm milk or cold water, to that degree which, in the practice of the particular dairy, is found from experience the most eligible. The milk produced on poor clayey lands is found to require more warming than that afforded by such as are rich, for where this is much heated the process is rendered more difficult. The frothy matter, arising in consequence of the air mixing with the new milk in pouring it into the cheese-tub, should be carefully skimmed off, and put into the cream vessels.

Breaking and gathering the Curd.—Though this business may appear simple and uniform, there are few particulars in the art of cheese-making wherein so great a difference is observable in practice. In some dairies the curd is at first broken or cut in various directions with a cheese-knife, an instrument made for the purpose, and used with a view of making the whey separate easily, and without carrying off with it any richness from the curd. After these first incisions some time is allowed for the broken curd to subside. The knife is then again used; and more freely than before; and while the operator stirs up the unbroken curd from the bottom with the skimming-dish in one hand, the larger pieces of curd are cut with the knife held in the other. Having thoroughly broken the curd, and allowed some time for its subsiding, the operator begins to take off the whey with the skimming-dish. In other dairies, not less celebrated for good cheese, the skimming-dish only is used in breaking the curd; and to facilitate the operation of separating the whey from the curd, some of the whey that first rises to the top is skimmed off, and being heated or cooled, according to the state of the weather, and the required consistence of the curd, is again returned into the cheese-tub, and after returning a little time, the whole is laded off in the usual manner. All the whey that can be extrac-

ted without pressure having been removed, and the cheese-tub being raised at one side, the curd is collected into a mass, and at first pressed with the back of the skimming dish. When no more whey can be discharged by this means, others more violent are adopted: the curd is in many cases cut with the cheese-knife, as before, to give vent to the whey, and is then pressed as hard as possible with the hands; in others a considerable weight is frequently applied. The curd having in a great measure separated from the whey, it is put into two or three pans, or other vessels, and the cheese-makers break it with their hands as fine as possible; in the course of doing which, a proper quantity of salt is scattered over the curd, and intimately mixed therewith.

In Gloucestershire, when the curd is broken to the requisite fineness, it is again returned into the cheese-tub, where it is scalded, by pouring over the minutely broken curd a pail full of hot water, or of whey, or of whey and water mixed. After the scalding water or whey is applied, the whole is briskly stirred; and being allowed to stand for some time for the curd to settle at the bottom of the tub, the scalding materials are skimmed or poured off; and the curd being pressed as before, so that no more whey can be extracted, it is put into the vat, and pressed in the common way. When it is properly broken, rubbed, and salted, a cloth is spread over the cheese-vat, and the broken curd being packed into it, and covered up with the cloth, a board is laid over the vat, and a weight, heavy in proportion to the quantity of curd, placed upon it; by which means the remaining whey is pressed out.

Mr. Marshall observes, that "it seems to be understood, that different grounds require different kinds of scalding liquor. The quantity is in proportion to the quantity of curd, enough to float the curd,—and make the mixture easy to be stirred about with the dish. Part of it is heated to near a boiling heat, and this lowered with cold liquid to a heat proportioned to the state of the curd; soft curd is scalded hot, hard curd with cooler liquid. In scalding, therefore, the dairy-woman has a remedy for any misjudgment her sense of feeling may have led her into in the stage of coagulation; let the curd come too soft or too hard, she can bring it to the desired texture by the heat of the scalding liquid. And here seems to hinge, principally, the superior skill of the Gloucestershire dairy-woman: by running the milk cool, she can, in scalding, correct any error which has been committed in the former operation."

Extensive dairies should always be plentifully furnished with vats of different sizes, as, when three or four cheeses are made at each meal, a number of vats become actually in use; and if there are not still a number empty, the operator becomes confu-

ned in choice, and cannot proportion exactly the vats to the quantity of curd in the cheese-tub; and by keeping a little overplus curd from meal to meal, a whole cheese is often spoiled.

Having made choice of a vat or vats, proportioned to the quantity of curd, so that the cheese, when fully pressed, shall neither over nor under-fill, the operator spreads a cheese-cloth loosely over the vat, into which he re-breaks the curd, carefully squeezing every part of it in the hand; and having filled the vat heaped up, and rounded above its top, folds over the cloth, and places it in the press.

Where the cheeses usually made are of a large size, the operator thrusts a number of iron skewers through holes made in the sides of the vat, for the purpose, into the curd in various directions. These being withdrawn, the openings made by them serve as so many drains for permitting the whey to run off. When the whey, instead of running freely, only falls in drops, the weight is removed, and the curd rebroken, and, being again put into the vat, is managed in the same manner as before, and repeated while a drop of whey can be extracted. The curd being now almost entirely freed from the whey, it is again placed in the vat, a clean cloth having been previously spread for the purpose of receiving and inclosing it.

Management in the Press.—After the vat has been properly placed in the press, a suitable degree of pressure is applied, which is more or less according to the sizes of the cheeses. In all large dairies there are two or three presses, all varying in respect to power, weight, or pressure. As soon as the vat is placed in the press, and the weight applied, skewers are again thrust in through the holes in the sides of the vat; this is done repeatedly during the first day the vat is in the press. From the time the vat is first placed in the press till it is again taken out, does not in common exceed two or three hours. When taken out the cheese is put in a vessel with warm or hot whey, in order to hardening its coat or skin, where it stands for an hour or two; it is then taken out, wiped dry, and after having remained some time to cool, is covered with a clean dry cloth, and the vat being wiped dry, and the cheese replaced, it is again put into the press. In the evening, supposing the cheese to have been made in the morning, which is the common time, it is again taken out of the vat, and another dry cloth being applied, is returned and replaced, what was formerly the upper becoming now the under side. In this manner it is taken out, wrapped in clean cloths, and turned in the vat twice a day for two days, when it is finally removed.—Cloths of finer qualities are made use of at the different turnings, in order that as little of their impressions as possible may be left on the cheese.

Salting.—After the cheese has been at last removed from the press, it is carried to the salting-house, and placed in a vat in a tub filled to a considerable depth with brine, in which it stands for several days, being regularly turned once at least every day. The vat is then removed from the brine-tub; and the cheese being taken out is placed on the salting-bench, where it stands for eight or ten days, salt being carefully rubbed over the whole every day during that period. When the cheese is of a large size, it is commonly surrounded with a wooden hoop, or fillet of cloth, to prevent renting. After it is supposed to be sufficiently salted, it is washed in warm water or whey, and, when well dried with a cloth, is placed on what is called the drying-bench, where it remains an equal length of time before it is removed to the keeping-house or cheese-chamber. In some dairies, the new cheeses are not put in brine, but kept in the vats on the salting-benches; and after being rubbed with salt, and turned in the vats daily for a week or ten days, the vats are removed and the cheeses managed as above. In other dairies, the cheeses are salted while the operation of pressing is performing. At every time they are taken out of the press for the purpose of being turned in the vats, they are well rubbed with salt, which for small thin cheeses is found to be sufficient; and therefore, when taken for the last time from the press, in place of any more salt being applied, they are set at once upon the drying-benches. In fact, the practice of immerging new-made cheeses in brine is only adopted where they are of so large a size, that rubbing salt on the outside would not be sufficient for answering the intended purpose.

Management in the cheese-room.—After the cheeses have been properly salted, and have acquired a competent degree of dryness, they are carried from the salting-house to the cheese-room, where after being smeared with fresh butter, they are laid on the floor, or on shelves for the purpose.—For the first ten days or a fortnight they are pretty smartly rubbed every day, and the smearing with butter repeated; but after that period it is only necessary to rub them two or three times a week; yet they should be turned every day while in the dairyman's possession, which is longer or shorter according to the season of the year, and the demand.—In order to hasten the maturation and coating of the cheese, the temperature of the room should be uniform and rather warm. In some cases the floors are prepared by being rubbed over with green vegetable substances, such as bean-tops, &c. and in others covered with dry substances; but these are probably unnecessary.

It is obvious that, in both the butter and cheese dairy, a great part of the profit must necessarily arise from the keeping and

fattening of hogs. In this intention the skim-milk, butter-milk, and cheese whey, should be converted to the purpose for which they are most adapted, which would seem to be that of supporting sows that have pigs, and rearing young pigs. It has been observed, that "in these applications they are better than any other article of food within the farmer's command, that is to be had equally cheap; and by means of keeping a number of breeding sows, proportioned to the use of the milk and the whey of the dairy, and making a proper provision for the other sort of hogs, so that they need not rob this application, the most profit possible will be made of these important objects to the farmer, by his cows and swine." In this system of management it is of vast advantage to have the hog-sties convenient to the dairy, with suitable sunk cisterns, properly formed for the reception and retention of the milk, whey, &c. which should be conveyed to them by pipes from the lip of the cheese-press, and a receiver on the outside of the dairy or scalding-room, so that every thing may be taken away without the labour of being carried, and nothing wasted.

PART III.

THE

BREEDING, REARING, AND MANAGEMENT

OF

LIVE STOCK.

CHAPTER I.

LIVE STOCK.

The grand characteristic of modern farming, and that which constitutes its greatest excellence, is the union of the cultivation of live stock with that of vegetables. Formerly, the growing of grain, and the rearing of cattle and sheep, constituted two distinct branches of farming; and it was a question among writers which was the most desirable branch to follow. The cultivation of roots and herbage crops at last led gradually to the soiling or stall feeding husbandry, and afterwards to the alternate husbandry, which has been more effectually than any thing else the means of improving agriculture, wherever it has been practised.

With regard to the live stock of a farm, the question most interesting to the farmer is, what is the best method of sustaining his stock advantageously, of fattening his superfluous cattle and sheep for market, and carrying the remainder well through a rigorous winter. On this subject the author of the Memoirs of the Board of Agriculture says, "I have before expressed an opinion that the superfluous grain we raise, and I mean particularly those kinds which are proper for the food of man, ought not to be consumed by beasts; and that means much more economical may be found to sustain fat animals. I allude here to green crops, to flax, and to roots. These admirable crops are attended with less expense than belongs to that common labour which is bestowed upon Indian corn; they obviate the necessity of Summer fallowing, whereby the use of the ground is saved for a whole season; they contain four times the quantity of nutritive matter that the best kind of grain does, acre for acre, and yield ten times the quantity of manure; when the grasses have ceased growing, owing to the decline of heat of the sun, these crops are in perfection, and if properly and liberally distributed, will bring animals in the fattest state into the Winter, and in which state they may be kept until it is convenient to dispose of them, by that secured portion of the crop not consumed out doors: and finally, the process necessary to the cultivation of these crops, is found of the precise steps which ought to be taken to insure a succeeding abundant crop of grain, and in most situations is the true

point to start from for a judicious rotation of crops. In speaking of green and root crops, I allude more particularly to turnips, rape, mangel wurtzel, tares, and potatoes, all of which are, under good management, the best possible preparations for succeeding crops, and banish the necessity of ruinous Summer fallows, as they are now practised. It is in this manner that under the stock system, the raising of grain more than sufficient for the uses of the establishment, ought not to be a direct object, but rather falls incidentally into this particular course of husbandry; and the farmer who caters upon this system, is true to the course which his situation exacts of him; he provides himself with abundance of vegetable crops to fatten his live stock, and to carry it through a severe Winter; and in doing that he not only lays the foundation for successive crops of valuable grains, but he gradually converts his farm into the condition of a garden; for such is the nature of the drill husbandry under which these green and root crops are cultivated, that the ground is put into a fine horticultural state. Every year adds to the comparative care of cultivation and to the rural beauty of the farm; and indeed, when the farmer has disciplined his land to such a nice point of clean rotations, his farm is in truth converted into a large garden. It is by pursuing this system, that Great Britain has attained to such eminence in rural economy; nor is there any intrinsic difficulty in the way, to prevent these advantages being common to this country, which yields to no other for fertility, salubrity, and beauty.

ON THE MOST DESIRABLE PROPERTIES OF LIVE STOCK.

Under the general term of *live stock*, are comprehended the various sorts of domesticated animals, which are employed by man as instruments for assisting him in labour, or converting to his use those productions of the soil, which are not immediately applicable to supply his wants in their natural state. Bakewell expressed the same idea, when he described live stock as machines for converting herbage, and other food for animals, into money. But money, in fact, is only the sign of wealth, while live stock are real riches.

The most desirable properties of live stock, may be considered under the following heads: 1, size; 2, form; 3, a tendency to grow; 4, early maturity; 5, hardiness of constitution; 6, prolific properties; 7, quality of flesh; 8, a disposition to fatten; and, 9, lightness of offal. The following observations on these points are principally applicable to animals destined for food.

1. *Size.*—Before the improvements introduced by Bakewell, the value of an animal was entirely judged by its bulk; and if a great size could be obtained, more regard was paid to the price the animal ultimately fetched, than to the cost of its food. Of

late, since breeders began to calculate with more precision, small or moderate-sized animals, have been generally preferred, for the following reasons:

Small-sized animals are more easily kept, they thrive on shorter herbage, they collect food where a large animal could hardly exist, and thence are more profitable. Their meat is finer grained, produces richer gravy, has often a superior flavour, and is commonly more nicely marbled or veined with fat, especially when they have been fed for two years. Large animals are not so well calculated for general consumption, as moderate sized, particularly in hot weather. Large animals poach pastures more than small ones. They are not so active, require more rest, collect their food with more labour, and will only consume the nicer and more delicate sorts of plants. Small cows, of the true dairy breeds, give proportionately more milk than large ones. Small cattle may be fattened solely on grass, of even moderate quality; whereas the large require the richest pasture, or to be stall-fed, the expense of which exhausts the profit of the farmer. It is much easier to procure well-shaped, and kindly-feeding stock of a small size, than of a large one. Small sized cattle may be kept by many persons, who cannot afford either to purchase or to maintain large ones; and by whom the loss, if any accident should happen to them, can be more easily borne. The small-sized sell better, for a butcher, from a conviction that, in proportion to their respective dimensions, there is a greater superficies of valuable parts in a small, than in a large animal, will give more money for two oxen of twelve stone each per quarter, than for one of twenty-four stone.

In favour of the large-sized, it is on the other hand contended, 1, That without debating whether from their birth, till they are slaughtered, the large or the small one eats most for its size, yet on the whole, the large one will pay the grazier or farmer who fattens him, as well for its food. 2, That though some large oxen are coarse grained, yet, where attention is paid to the breed the large ox is as delicate food as the small one. 3, That if the small sized are better calculated for the consumption of private families, of villages, or of small towns, yet that large cattle are fitter for the markets of great towns, or where the demand is great. 4, That were the flesh of small-sized oxen better, when fresh, yet the meat of the large-sized is unquestionably more calculated for salting, a most essential object in a maritime and commercial country, for the thicker the beef the better it will retain its juices when salted, and the fitter it is for long voyages. 5, That the hide of the large ox is of very great consequence in various manufactures. 6, That large stock are in general distinguished by a greater mildness of disposition. 7, That where the

pastures are good, cattle and sheep will increase in size, without any particular attention on the part of the breeder; large animals are naturally therefore the proper stock for such pastures. 8, That the art of fattening cattle, and even sheep, with oil-cake, being much improved and extended, the advantage of that practice would be of less consequence, unless large oxen were bred, as small oxen can be fattened with grass and turnips, as well as oil-cake; and lastly, that large oxen are better calculated for working than small ones, two large oxen being equal to four small ones in the plough or the cart.

Such are the arguments generally made use of on both sides of the question; from which it appears that much must depend upon pastures, taste, mode of consumption, markets, &c. and that both sizes have their advantages. The intelligent breeder, however, (unless his pastures are of a nature peculiarly forcing), will naturally prefer a moderate size, in the stock he rears.

2. *Form.*—Though it is extremely desirable to bring the shape of cattle to as much perfection as possible, yet profit and utility ought not to be sacrificed for mere beauty, which may please the eye, but will not fill the pocket; and which depending much upon caprice, must be often changing.

In regard to form, the most experienced breeders seem to concur in the following particulars: 1, That the form or shape should be compact, so that no part of the animal should be disproportioned to the other parts, and the whole distinguished by a general fulness and rotundity of shape; 2, That the chest should be broad, for no animal whose chest is narrow can easily be made fat; 3, That the carcass should be deep and straight; 4, That the belly should be of a moderate size; for when it is more capacious than common in young animals, it shows a diseased state, and in older ones, it is considered a proof that the animal will not return in flesh, in milk, or in labour, the value of the extra quantity of food which it consumes; 5, That the legs should be short, for the long-limbed individuals of the same family or race, are found to be the least hardy, and the most difficult to rear or to fatten; and, 6, That the head, the bones, and other parts of inferior value, should be as small as is consistent with strength, and with the other properties which the animal ought to possess. In animals bred for the market, the form must likewise be such, as to contain the greatest possible proportion of the finer, compared to the coarser and less valuable parts of the animal. This, by selection, may be attained; and thus the wishes of the consumer may be gratified. As to the broad loins and full hips, which are considered as a point of excellence in particular breeds, it is evident, that the old, narrow, and thin make, required improvement; but the alteration is now

carried to a faulty excess, and often occasions great difficulty and danger in calving.

Of the form of animals, eminent surgeons have given the following as the chief particulars: 1, That the external form is only an indication of the internal structure; 2, That the lungs of an animal is the first object to be attended to, for on their size and soundness, the health and strength of an animal principally depend; 3, That the external indications of the size of the lungs are the form and size of the chest, and its breadth in particular; 4, That the head should be small, as by this the birth is facilitated, as it affords other advantages in feeding, &c., and as it generally indicates that the animal is of a good breed; 5, That the length of the neck should be in proportion to the size of the animal, that it may collect its food with ease; and 6, That the muscles and tendons should be large, by which an animal is enabled to travel with greater facility.

It was formerly the practice, to estimate the value of animals by the size of their bones. A large bone was considered to be a great merit; and a *fine boned* animal, always implied a great size. It is now known, that this doctrine was carried too far. The strength of an animal does not depend upon the bones, but on the muscles; and when the bones are disproportionably large, it indicates an imperfection in the organs of nutrition. Bakewell strongly insisted on the advantages of small bones; and the celebrated John Hunter declared, that small bones were generally attended with corpulence, in all the various subjects he had an opportunity of examining. A small bone, however, being heavier and more substantial, requires as much nourishment as a hollow one, with a larger circumference.

3. *A tendency to grow.*—Among the qualities for which thorough-bred cattle and sheep are distinguished, that of being *good growers*, and having a good length of frame, is not the least essential. The meaning of which is, that the animal should not only be of a strong and healthy constitution, but speedily should grow to a proper size. Animals having the property *of growing*, are usually straight in their back and belly; their shoulders well thrown back, and their belly rather light than otherwise. At the same time, a gauntness and paucity of intestines should be guarded against, as a most material defect, indicating a very unthrifty animal. Being *too light of bone*, as it is termed, is also a great fault. A good grower, or hardy animal, has always a middling sized bone. A bull distinguished for getting good growers, is inestimable; but one whose progeny takes an unnatural or gigantic size, ought to be avoided.

4. *Early Maturity.*—Arriving soon at perfection, not only in

point of *growth* or size, but in respect to *fatness*, is a material object for the farmer, as his profit must in a great measure depend upon it. Where animals, bred for the carcass merely, become fat at an early age, they not only return sooner the price of their food, with profit to the feeder, but in general also, a greater value for their consumption, than slow-feeding animals. This desirable property greatly depends on a mild and docile disposition; and as this docility of temper is much owing to the manner in which the animal is brought up, attention to inure them early to be familiar, cannot be too much recommended. A tame breed also has other advantages. It is not so apt to injure fences or to break down into adjacent fields, consequently it is less liable to accidents, and can be reared, supported, and fattened, at less expense. The property of early maturity, in a populous country, where the consumption of meat is great, is extremely beneficial to the public, as it evidently tends to furnish greater supplies to the market; and this propensity to fatten at an early age, is a sure proof that an animal will fatten speedily at a later period of his life.

5. *Hardiness of constitution.*—In the wilder and bleaker parts of the country, the possession of a hardy and healthy constitution is a most valuable property in stock. Where the surface is barren, and the climate rigorous, it is essential that the stock bred and maintained there, should be able to endure the severities and vicissitudes of the weather, as well as scarcity of food, hard work, or any other circumstances in its treatment, that might subject a more delicate breed to injury. In this respect, different kinds of stock greatly vary; and it is a matter of much consequence, to select, for different situations, cattle with constitutions suitable to the place where they are to be kept. It is a popular belief, that dark colours are indications of hardiness. In mountain breeds of cattle, a rough pile is reckoned a desirable property, more especially when they are to be kept out all Winter. It enables them to face the storm, instead of shrinking from it. Hardy breeds are exempted from various diseases, as having yellow fat, also being *lyery*, or blackfleshed, defects so injurious to stock.

6. *Prolific quality.*—By this property is meant, that the females of a breed, both bear more frequently than usual, and also have frequently more than one at a birth. This property runs more strikingly in sub-varieties, or individual families; and though partly owing to something in the habits of animals, and partly to their previous good or bad treatment, yet in some degree seems to depend on the seasons, some years being more distinguished for twins than others. In breeding, not only the numbers, but the sex of the offspring, in some cases, seem to depend upon the

female parent. Two cows produced fourteen females each in fifteen years, *though the bull was changed every year.* It is singular, that when they produced a bull calf, it was in the same year. Under similar circumstances, a great number of males have been produced by the same cow in succession, but not to the same extent.

7. *Quality of Flesh.*—Breeds are likewise distinguished by the quality of their flesh. In some kinds it is coarse, hard, and fibrous; in others of a finer grain or texture. In some breeds also, the flavour of the meat is superior;—the gravy they produce instead of being white and insipid, is high-coloured and rich;—and the fat is intermixed among the fibres of the muscles, giving the meat a streaked or marbled appearance. Breeds whose flesh have these properties, are peculiarly valuable. Hence two animals of nearly the same degree of fatness and weight, and who could be fed at nearly the same expense to the husbandman, will sell at very different prices, merely from the known character of their meat.

8. *A disposition to Fatten.*—This is a great object in animals destined for the market. Some animals possess this property during the whole progress of their lives, while in others, it only takes place at a more advanced period, when they have attained their full growth, and are furnished at the same time with a suitable supply of food. There are in this respect other distinctions: 1, Most sort of cattle and sheep, which have been bred in hilly countries, will become fat on lowland pastures, on which the more refined breed would barely live; and, 2, Some animals take on fat very quickly, when the proper food has been supplied, and some individuals have been found, even in the same breed, which have, in a given time, consumed the least proportional weight of the same kind of food, yet have become fat at the quickest rate. Even in the human race, with little food, some will grow immoderately corpulent. It is probably from internal conformation, that this property of rapid fattening is derived.

The advantage and disadvantages of fattening cattle and sheep, at least to the extent frequently practised at present, are points that have of late attracted much public attention. But any controversy on that subject, can only arise from want of proper discrimination. Fat meat is unquestionably more nourishing than lean, though to digest this oily matter, there are required, on account of its difficult solubility, a good bile, much saliva, and a strong stomach; consequently none, except those who are in the most vigorous state of health, or who are employed in hard labour, can properly digest it. Though fat meat, however, is unfit for general consumption, yet experiments in the art of fattening animals, are likely to promote useful discoveries; and, though in

the course of trying a number of experiments, errors and excesses may be committed, yet on the whole, advantage may be derived from the knowledge thus to be obtained. As the bone also gains but little in the fatting animal, and the other offal becomes proportionably less as the animal becomes more fat, the public has not sustained much loss by over-fatted animals. To kill even hogs till they are thoroughly fat, is exceedingly bad economy. An ox or cow, though the little flesh it has may be of good quality, yet presents when lean, little but flesh and bones; and if slaughtered in that state, would neither indemnify the owner for the expence of breeding and maintaining it, nor benefit the public. A coarse and heavy-fleshed ox, which would require a very long time, and much good food to fatten, may be slaughtered with most advantage, while rather lean. It is not, however, so much the extent of fat, as the want of a sufficient quantity of lean flesh, of which the consumer complains; for it cannot be doubted, that the lean flesh of a fat animal, is superior in quality, and contains more nourishment, than any other meat.

Here it may be proper to mention, that indication of a tendency to fatten, which is technically called *handling well*. The graziers and butchers in various parts of the kingdom, had recourse to the hand, and the feeling of the skin, or cellular membrane, for ascertaining a disposition to fatten; but since Bakewell directed the public attention so much to breeding, that practice has become more generally known. Handling cannot easily be defined, and can only be learnt by experience. The skin and flesh of cattle, when handled, should feel soft to the touch, somewhat resembling that of a mole, but with a little more resistance to the finger. A soft and mellow skin must be more pliable, and more easily stretched out, to receive any extraordinary quantity of fat and muscle, than a thick or tough one. The rigid-skinned animal, must therefore always be the most difficult to fatten. In a good sheep, the skin is not only soft and mellow, but in some degree elastic. Neither cattle nor sheep can be reckoned good, whatever their shape may be, *unless they are first-rate handlers*.

The improved short horned breed, besides their mellowness of skin, are likewise distinguished by softness and silkiness of hair. Too great a length, however, ought not to be aimed at, since it is not easy, in that case, to preserve a due proportion in the appearance of the animal, without which it cannot be considered perfect.

9. *Lightness of Offal.*—It is also of much importance that an animal solely bred for the market, should have as little *offal*, or parts of inferior value, as possible, (consistently with the health of the animal), and consequently a greater proportion of food for man.

ON THE PRINCIPLES OF IMPROVED BREEDING.

The art of improved breeding consists in making a careful selection of males and females, for the purpose of producing a stock, with fewer defects, and with greater properties, than their parents; by which their mutual perfections shall be preserved, and their mutual faults corrected.

The objects of improved breeding, therefore, are, to obviate defects, and to acquire and to perpetuate desirable properties; hence, when a race of animals have possessed, in a great degree, through several generations, the properties which it is our object to obtain, and any tendency to produce unwished for properties has been extirpated, their progeny are said to be *well-bred*, and their stock may be relied on.

It was upon this principle of selection, that Bakewell formed his celebrated stock of sheep, having spared no pains or expence in obtaining the choicest individuals from all the best kinds of long or combing woolled sheep, wherever they were to be met with; and it cannot be doubted that any breed may be improved in the same manner, namely, that of putting the best males to the finest females. After a superior breed, however, has thus been obtained, it is a point that has been much disputed, whether it is proper to raise stock—1, From the same family; or 2, From the same race but of different families; or, 3, From races entirely different.

1. *Breeding from the same family.*—This method is called breeding *in-and-in*, or putting animals of the nearest relationship together. Though this plan was for some time in fashion, under the sanction of Bakewell's authority, yet experience has now proved, that it cannot be successfully persevered in. It may prove beneficial, indeed, if not carried too far, in fixing any variety that may be thought valuable, but on the whole, it is so only in appearance. Under this system, the young animal comes into the world, on comparatively a very small scale. By keeping it fat from the first moment of its existence, it is made to attain a greater size than nature at first intended: and its weight in consequence, will be very great, in proportion to the size of its bones. Thus a generation or two of animals of an extraordinary form, and saleable at enormous prices, may be obtained; but that does not prove that the practice is eligible, if long persisted in. On the contrary, if the system be followed up, the stock get tender and delicate, they become bad feeders; and though they retain their shape and beauty, they will decrease in vigour and activity, will become lean and dwarfish, and ultimately incapable of continuing the race. The instances of this are numerous. This proves how unprofitable such connexions are. That is no reason, however, why a breeder may not manage a particular

family of animals to great advantage, by shifting or changing, instead of breeding directly from parents to offspring. Hence the propriety of procuring males, from the flocks and herds of those who have the same, or a similar breed. It has been remarked, that those farmers have in general the worst flocks, who breed from rams produced on their own farms, and that an interchange of males is mutually beneficial.

With respect to the doctrine, "that when you can find no better males than your own, then by all means breed from them, for that best can only beget best," it is ably refuted by an intelligent author, who has devoted much attention to the art of breeding. He observes, that there never did exist an animal, without some defect in constitution, in form, or in some other essential quality; and such defect, however small it may be at first, will increase in every succeeding generation, and at last predominate in such a degree as to render the breed of little value. Breeding *in-and-in*, therefore, would only tend to increase, and to perpetuate that defect, which might be eradicated by a judicious selection from a different family in the same race.

2. The breeding from different families of the same race, is therefore a preferable system. When these have been for some time established in different situations, and have had some slight shades of difference impressed upon them, by the influence of different climates, soils, and treatment, it is found advantageous to interchange the males, for the purpose of strengthening the excellencies, and remedying the defects, of each family. On this principle, the celebrated Culley continued, for many years, to hire his rams from Bakewell, at the very time that other breeders were paying him a liberal price for his own; and the very same practice is followed by the most skilful breeders at present.

3. Any attempt at improvement, *by crossing* two distinct breeds or races, one of which possesses the properties which it is wished to obtain, or is free from the defects which it is desirable to remove, requires a degree of judgment and perseverance, to render such a plan successful, as is very rarely to be met with. Indeed, though such crosses may, by great attention answer at first, yet it is generally found, that great singularities attend such mixtures; and, in breeding bulls, though some of them may apparently do, yet their breed is not to be trusted.

Crossing with larger males from another country, is sometimes attempted with a view of enlarging the size of stock. But such attempts should be made with great caution; for by mistaken practice, extensively pursued, irreparable mischief may be effected. Where a particular race of animals has continued for centuries, it may be presumed, that their constitution is adapted to the soil and climate. Any attempt, therefore, to increase the size of

a native race of animals, without improving their food, by which their size is regulated, is a fruitless effort to counteract the laws of nature. In proportion to their increase of size, by crossing, they become less in form, less hardy, and more liable to disease. The only satisfactory and judicious mode of changing the size of any race of animals is, by maintaining better the original stock of the country, more especially during their youth. In every case, where the enlargement of the carcass is the object, the cross breed must be better fed than the native parent. Hence, if a good stock can be otherwise obtained, crossing ought to be avoided, for it produces a species of mongrel, and it is more difficult to get rid of the imperfections thus introduced into a breed, than is commonly imagined.

It is now the general opinion, that any improvement of form by crossing, must entirely depend on selecting a well-formed female, larger in size than the usual proportion between females and males. The fœtus will thus be better nourished, which is so essential to the production of an animal with the most perfect form. Abundant nourishment is necessary, from the earliest period of its existence, until its growth is complete. Upon this principle, the breed of English horses were improved, by crossing them with diminutive stallions, Barbs and Arabians. The celebrated Clydesdale breed of horses in Scotland, originated from the introduction of some large Flanders mares into that country; and our own hogs have been improved by crossing with small Chinese boars. Other experiments on the same principle, have also succeeded.

The improvement of the fleece depends, however, upon the male; it being proved, that in the course of four or five generations, using always the Merino ram, fleeces rivalling the Spanish may be obtained from ewes of common stock.

In regard to the period of commencing breeding, a cow in general should not produce a calf, at an earlier period than three years old. A bull may be used at fourteen or eighteen months. He then shews more vigour and more energy, than may be expected in his produce. At two or three years old, they frequently become ungovernable, and are killed. Many contend that the offspring of a bull, if well bred, becomes generally better till he reaches seven or eight years, and indeed till his constitution is impaired by age. This doctrine, however, does not agree with the practice of some breeders; nor can the question be finally decided without a regular course of experiments. In breeding sheep, the age of the ram is not considered to be a point of much importance.

Some breeders maintain, that the offspring take considerably more after the male, than the female parent. It is believed, how-

ever, that some parts of the offspring take after the male, and some after the female. If the female be small, the legs of the offspring will seldom be influenced by the male, but much by the female parent in the womb, and will not subsequently change. The width and depth, and consequently the weight of carcass, will be greatly influenced by the male; and if it be of a large kind, the offspring will present great weight in a small compass.

Among the rules of breeding, one is, that the young should be brought forth at the season of the year, when there is usually a full supply of suitable food. This is particularly necessary to be attended to on high and exposed situations, where there is little or no other provision than common pastures. Where this rule has not been adverted to, great losses have been sustained. It is necessary at the same time to guard against an opposite extreme, and to take care that the birth shall not be so late in the season, that there shall be any risk of the young animal being unable to bear the cold, and severities of the ensuing Winter.

Another rule in breeding is, never to fix on the ewes to be put to a favourite ram, until the lambs got by him the preceding year, have been examined. The perfections and defects of his progeny, are thus ascertained, and ewes are given him accordingly. By such attention, and carefully selecting from the lambs, rejecting all doubtful ones, a flock is kept in a constant state of progressive improvement.

A third rule is, in selecting a male from a small number not to choose the weakest male, though it may possess the most delicate form, and approach the nearest to female symmetry; for if the same system were to be continued for a few generations, it may easily be supposed that such a breed will dwindle, compared to one left to the process of nature, in which the strongest males driving off the weakest, are exclusively employed for the propagation of the kind.

It is farther necessary to observe, that any defect in a breed, will not only be transmitted uncorrected, but will necessarily increase in the progeny; a tendency to that defect being inherited by both parents, and both being immediately descended from its original propagator. This defect may be in respect of size, form, inclination to feed at an early age, to feed fat with a comparative small consumption of vegetable food, to lay that fat on valuable points, or in constitutional health; and according to the nature of the original defect, the breed will become bad feeders, or incapable of producing any but an unhealthy offspring.

On this branch of the subject, it may be proper to add, that the justly celebrated Bakewell, was the father of the improved system of breeding. He was, by nature, a strong-minded man, and a superior judge of stock for the times in which he lived. Ex-

perience, however, has since made the art more perfect, though it is of all others the one in which blunders are most easily committed. The art is eminently useful, and is capable of almost unlimited improvement; but it requires so much attention and expence, that it can never be kept up with spirit, without liberal encouragement and good prices.

ON THE PROPER MANAGEMENT OF STOCK IN GENERAL.

This is a subject which can only, in this place, be slightly touched upon. It is an object of very great consequence to every husbandman, to expend, in the most economical and advantageous manner, the vegetable produce allotted for the maintenance of his stock, and to bestow it chiefly on those, from whom he is likely to derive the greatest and the earliest benefit. Notwithstanding many recent and truly valuable improvements, there still prevails in regard to some particulars, a sad mixture of profusion on the one hand, and penuriousness on the other. The saving to the public, by careful attention to the feeding of live stock, would at all times be great, but in times of scarcity, would be incalculable. For the attainment of that object, it would be necessary to pay regard to: 1, The due preparation and frugal expenditure of their food; 2, The appropriation of that food to the different sorts respectively, according to the different species and breeds of stock,—their different habits and degrees of hardiness, and the different degrees of exercise, and modes of treatment to which they are subjected; and, 3, The requisite attention to the demands of different periods, the relative effects of different seasons, and the state of the animals themselves, in regard to age, fatness, &c. &c.

The following general rules, as to the feeding and management of stock, may deserve attention.

1. Animals intended for the butcher should be kept in a state of regular improvement. The finer breeds are highly fed from their birth, and are almost always fat. With other breeds, and on pastures of inferior quality, this is neither necessary nor practicable. But in every case, the same principle of improvement should be adhered to, and such animals ought never to be allowed to lose flesh, in the hopes of afterwards restoring it by better feeding.

2. The size should never be above that which the pastures can support in a thriving condition; nor can any thing be more injudicious, than to endeavour to increase the size of stock by crossing, without improving their pasture. The stock of every kind, and of all the various breeds, should, in respect to size, be proportioned to the quantity and the quality of their intended food.

3. The best pasture should be allotted to that portion of the stock which goes first to market; the next in quality, to the breeders; and the less valuable pasture, to the inferior or growing stock. This division is highly advantageous. One hundred acres under this plan, would feed more than one hundred and twenty promiscuously pastured.

4. Great care should be taken not to overstock pasture, a practice which is attended with great loss to the farmer and the community. This ought to be particularly avoided in regard to young and growing animals. If they are kept poor during one part of the year, they will scarcely thrive during the remainder; and when ill fed, will never attain their proper size and proportion; at the same time young stock, (their powers of digestion being stronger) may be fed on stronger and more succulent food, than those who are more advanced, and of age capable of being fattened.

5. The kind of food given to animals, should be suited to their ages. In the habit of young animals there aborends, and seems necessary for their welfare, a great proportion of fluid; and therefore more succulent food may be preferable for them; but when they are more advanced and vigorous, the digestive powers being stronger, and time being requisite for the process of growth, provision less nutritious, or of a coarser quality, may suffice. A dry kind of food would appear to agree better with all animals in Winter, when the perspiration is less than in Summer, during which season, moister provision should seem to be more suitable. When fed on dry food, and more especially if the quality is coarse, the stock should be well supplied with water, to promote its digestion in the stomach. It is indeed a good plan previously to moisten any hay given to cattle, and in a less degree even to horses.

6. In regard to the diseases of stock, it may in general be observed, that the great object of the farmer ought to be, to ward them off, by obviating their remote causes; for most of those which affect our domestic animals, when once induced, are not easily cured, partly from their obscure nature, and partly from the difficulty of exhibiting remedies to the large numbers which are frequently seized at the same period, or in the same situation. In particular districts, many herds and flocks are considerably thinned almost every year, by inflammatory and other disorders, which a little care, and good treatment applied in time, might easily have prevented.

Lastly, the food, whatever it consists of, should not be too suddenly changed. It is seldom profitable to bring lean animals immediately from coarse to rich pastures; and a change from dry to succulent food, and *vice versa*, should be gradually effect-

ed. A change of pasture, however, of the same quality, tends to produce a greater accumulation of fat.

It may be proper to add, that nature seems to have designed different sorts of animals for different purposes. A breed of cattle, equally well adapted to the butcher, to the dairy, and to the plough or cart, is no where to be met with; and, so far as experience enables us to judge, these properties are hardly consistent with each other, and belong to animals of different forms and proportions. The judicious breeder, therefore, will fix upon one object to be principally attended to; and he will endeavour to rear the species of stock best suited to attain the object he has in view, or, in other words, the most likely to pay the most money, for the food he gives them. That can only be obtained by an attention to the principles of breeding in general,—to the system best calculated for his own situation in particular; and to the practice of the most eminent farmers who have excelled in the art.

In regard to live stock, in general, it may be observed that we ought to have in view, the keeping up of such a diversity of kind, of size, and of habit, as seem best adapted to answer our principal demands, and are the mostly likely to agree with the situation, climate, produce, and other general circumstances of the country.

CHAPTER II.

THE HORSE.

Breeding.—Our observations on this subject must be of a general nature, and will be very simple; and the axiom we would lay down is, that "like will produce like," that the progeny will inherit the mingled qualities of the parent. There is scarcely one single disease by which either of the parents is affected that the foal will not inherit, or, at least, the predisposition to it; even the consequences of ill usage or hard work will descend to the progeny. We have repeated proof that blindness, roaring, thick wind, broken wind, spavins, curbs, ring-bones and founder, have been bequeathed both by the sire and the dam to the offspring. It should likewise be recollected, that although these blemishes may not appear in the immediate progeny, they frequently will in the next generation. Hence the necessity of some knowledge of the parentage both of the sire and the dam.

Peculiarities of form and constitution will also be inherited. This is a most important but neglected consideration; for however desirable or even perfect may have been the conformation of the sire, every good point may be neutralized or lost by the defective form, or want of blood, of the mare. There are niceties in this which are important. For when we are careful that the essential points should be good in both parents, and that some minor defects in either should be met and got rid of by excellence in that particular point in the other, the result will be good. The unskilful or careless breeder will often so badly pair the animals, that the good points of each will be in a manner lost; the defects of both will be increased, and the produce will be far inferior to both sire and dam.

We would wish then to impress it on the minds of breeders, that peculiarity of form and constitution are inherited from both parents; that the excellence of the mare is a point of quite as much importance as that of the horse; and that out of a sorry mare, let the horse be as perfect as he may, a good foal will rarely be produced.

It may perhaps be justly affirmed, that there is more difficulty

in selecting a good mare to breed from, than a good horse, because she should possess somewhat opposite qualities. Her carcase should be long to give room for the growth of the fœtus, and yet, with that there should be compactness of form and shortness of leg.

As to the shape of the stallion, little satisfactory can be said. It must depend on that of the mare, and the kind of horse wished to be bred; but if there be one point which we would say is absolutely essential, it is "compactness,"—as much goodness and strength as possible condensed in a little space.

Next to compactness, the inclination of the shoulder will be regarded. A huge stallion with upright shoulders never got a capital hunter or hackney. From him the breeder can obtain nothing but a cart or dray horse, and that perhaps spoiled by the opposite form of the mare. On the other hand, an upright shoulder is desirable, if not absolutely necessary, when a mere draught horse is required.

It is of no little importance that the parents should be in full possession of their natural strength and powers. It is a common error that because a mare has once been good, she is fit for breeding when she is no longer capable of ordinary work. Her blood and perfect frame may insure a foal of some value, but he will inherit a portion of the worn-out constitution of her from whom he sprung.

On the subject of breeding *in-and-in*, that is, persevering in the same breed, and selecting the best on either side, much has been said. The system of crossing requires much judgment and experience; and should be attempted with great caution, and the most perfect of the same breed should be selected, but varied by being frequently taken from different stocks. This is the secret of the course.

A mare is capable of breeding at three or four years old; some have injudiciously commenced at two years, before her form and strength is sufficiently developed, and with the developement of which, their early breeding materially interferes. If she does little more than farm work, she may continue to be bred from until she is nearly twenty; but if she has been hardly worked, and bears the marks of it, let her have been what she will in her youth, she will deceive the expectations of the breeder in her old age.

The mare comes into heat in the early part of Spring. She is said to go with foal eleven months, but there is sometimes a very strange irregularity about this. Some have been known to foal four weeks earlier, while the time of others has been extended six weeks beyond the eleven months. We may however take eleven months as the average time. The mare should go to

cover, so as to foal when there begins to be sufficient food for and her colt, without confining them to the stable.

From the time of covering to that of foaling, the mare may be kept at moderate work, and that not only without injury, but with decided advantage. The work may be continued up to the very time when she is expected to foal, and of which she will give at least one day's notice, by the adhesive matter that will appear about the teats. When this is seen it will be prudent to release her from work, and keep her near home, and under the frequent inspection of some careful person.

When nearly half the time of pregnancy has elapsed, the mare should have a little better food. She should be allowed one or two feeds of grain in the day. This is about the season when they are accustomed to slink their foals, or when abortion occurs; at this time, therefore, the eye of the owner should be frequently upon them. Good feeding and moderate exercise will be the best preventives against this. The mare that has once slinked her foal, is ever liable to the same accident, and therefore should never be suffered to be with other mares about the same time that this usually occurs, which is between the *fourth* and fifth months; for such is the power of imagination or sympathy in the mare, that if one of them suffers abortion, the greater number of those in the same pasture will share the same fate.

If a mare has been regularly exercised, and apparently in health while she was with foal, little danger will attend the act of parturition. If there be any false presentation of the fœtus, or difficulty in producing it, it will be better to have recourse to a well informed practitioner, rather than injure the mother by the violent and injurious attempts which are often made to relieve her.

As soon as the mare has foaled, she should be turned into some well sheltered pasture, with a hovel or shed to run into when she pleases; and if the grass is scanty, she should have a couple of feeds of grain daily. The breeder may depend upon it that nothing is gained by starving the mother and stinting the foal at this time. It is the most important time to the life of the horse; and if from false economy his growth be arrested now, his puny form and want of endurance will ever afterwards testify the error that has been committed. The grain should be given in a trough on the ground, that the foal may partake of it with the mother. When the new grass is flush and plenty, the grain may be gradually discontinued.

The mare may be put to moderate work again a month after foaling. The foal is at first shut in the stable during the hours of work; but as soon as it acquires sufficient strength to tottle after the mare, and especially when she is at slow work, it will be better for the foal and the dam that they should be together. The

work will contribute to the health of the mother; the foal will more frequently draw the milk and thrive better; and will be hardy and tractable, and gradually familiarised with the objects among which it is afterwards to live. While the mother, however, is thus worked, she and the foal should be well fed; and two feeds of grain at least, should be added to the green food which they get when turned out after their work at night. The mare will usually be found at heat, at or before the expiration of a month from the time of foaling, when if she be kept principally for breeding purposes, she may be put again to the horse.

In five or six months, according to the growth of the foal, it may be weaned. It should then be housed for three weeks or a month, or turned into some distant rick-yard. There can be no better place for the foal than the latter, as affording, and that without trouble, both food and shelter. The mother should be put to harder work, and have dried meat. One or two urine balls or a physic ball will be useful, if the milk should be troublesome, or she should pine after her foal.

There is no principle of greater importance than the liberal feeding of the foal during the whole of his growth, and at this time in particular. Bruised oats and bran should form a considerable part of his daily provender. The farmer may be assured that money is well laid out which is expended on the liberal nourishment of the growing colt; while, however, he is well fed, he should not be rendered delicate by excess of care. A racing colt is sometimes stabled; but one that is destined to be a hackney or an agricultural horse, should merely have a square rick, under the leeward side of which he may shelter himself, or a hovel into which he may run at night out of the rain.

Breaking-in.—The process of breaking in should commence from the very period of weaning. The foal should be daily handled, partially dressed, accustomed to the halter, led about, and even tied up. The tractability, and good temper, and value of the horse, depend a great deal more upon this than breeders are aware: this should be done as much as possible by the man by whom they are fed, and whose management of them should always be kind and gentle. There is no fault for which a breeder should so invariably discharge his servant as cruelty or even harshness towards the rising stock; for the principle on which their after usefulness is founded, is early attachment to and confidence in man, and obedience, implicit obedience, resulting principally from these.

After the second Winter, the work of breaking in may commence in good earnest. He may first be bitted carefully, and a bit carefully selected that will not hurt his mouth, and much smaller than

those in common use; with this he may be suffered to amuse himself, and to play and to champ for an hour on a few successive days.

Having become a little tractable, portions of the harness may be put upon him, and, last of all, the blind winkers; and a few days afterwards he may go into the team. It would be better if there could be one before and one behind him, beside the shaft horse. Let there be first the mere empty wagon. Let nothing be done to him except that he may have an occasional pat or kind word. The other horses will keep him moving and in his place; and no great time will pass, sometimes not even the first day, before he begins to pull with the rest, when the load may be gradually increased.

The agricultural horse is wanted to ride as well as to draw. Let his first lesson be given when he is in the team. Let his feeder if possible be put upon him; he will be too much hampered by his harness and by the other horses, to make much resistance, and, in the majority of cases, will quietly and at once submit. We need not repeat, that no whip or spur *should* be used in giving the first lessons in riding.

When he begins to understand his business, backing, the most difficult part of his work, may be taught him; first to back well without any thing behind him, then with a light cart, and afterwards with some serious load; and taking the greatest care not seriously to hurt the mouth. If the first lesson causes much soreness of the gums, the colt will not readily submit to a second. If he has been rendered tractable before by kind usage, time and patience will do all that can be wished here. Some persons are in the habit of blinding the colt when teaching him to back; it may be necessary with the restive and obstinate one, and should be used only as a last resort.

The colt having been thus partially broken in, the necessity of implicit obedience may be taught him, and that not by severity, but by firmness and steadiness; the voice will go a great way, but the whip and the spur is sometimes indispensable; not so cruelly applied as to excite the animal to resistance, but to inform him that we have the power to enforce submission. Few, we would almost say no horses, are naturally vicious. It is cruel usage which has first provoked resistance; that resistance has been followed by greater severity, and the stubborness of the animal has increased; open warfare has ensued, in which the man seldom gained an advantage, and the horse was frequently rendered unserviceable. Correction may or must be used to enforce implicit obedience, after the education has gone to a certain extent, but the early lessons should be inculcated with kindness alone. Young colts are sometimes very perverse; many days

will occasionally pass before they will permit the bridle to be put on, or the saddle to be worn; one act of harshness will double or treble this time. On some morning of better humour than usual, the bridle will be put on and the saddle will be worn, and this compliance being followed by kindness and soothing on the part of the breaker, and no inconvenience or pain being suffered by the animal, all resistance will be at an end.

The same principles will apply to the breaking in the horse for the road. The handling and some portion of instruction should commence from the time of weaning. The future tractability of the horse will greatly depend upon this. At two years and a half or three years, the regular process of breaking in should come on. If it be delayed until the animal is four years old, his strength and obstinacy will be more difficult to overcome. We cannot much improve on the plan usually pursued by the breaker, except that there should be much more of kindness and patience, and far less harshness and cruelty, than is sometimes exhibited, and a great deal more attention to the form and natural action of the horse.

The education of the horse is that of the child: pleasure is, as much as possible, associated with the early lessons; but firmness, or if need be, coercion, must confirm the habit of obedience.

Castration.—The period at which this important operation will be best performed, depends much on the breed and form of the colt, and the purpose for which he is destined. For the common agricultural horse, the age of four or five months will be the most advisable, or at least before he is weaned. Very few horses are lost when cut at that age. The weather, however, should not be too hot, nor the flies too numerous. We enter our decided protest against the recommendation of some valuable but incautious agricultural writers, that "colts should be cut in the month of June or July, when flies pester the horses, and cause them to be continually moving about, and thereby prevent swelling." One moment's reflection will convince the reader that nothing can be more likely to produce inflammation and consequent swelling and danger, than the torture of the flies hovering round and stinging the sore part.

If the horse is designed either for the carriage or for heavy draught, the farmer should not think of castrating him until he be at least a twelvemonth old; and even then the colt should be carefully examined. If he is thin and spare about the neck and shoulders, and low in the withers, he will materially improve by remaining uncut another six months; but if his fore quarters are fairly developed at the age of twelve months, the operation should not be delayed lest he become heavy and gross before, and per-

haps have begun too decidedly to have a will of his own. No specific age, then, can be fixed; but the castration should be performed rather late in the Spring or early in the Autumn, when the air is temperate, and particularly when the weather is dry. No preparation is necessary for the sucking colt, but it may be prudent to bleed and to physic one of a more advanced age. In the majority of cases no after treatment will be necessary, except that the animal should be sheltered from intense heat and more particularly from wet. In temperate weather he will do much better running in the fields than nursed in a close and hot stable. The moderate exercise which he will take in grazing will be preferable to a perfect inaction. A large and well ventilated box, however, may be permitted.

The manner in which the operation is performed will be properly left to the operator; although we must confess we are disposed to adhere to the old way of opening the bag on either side, cutting off the testicles, and preventing bleeding by searing the vessels with a red hot iron. There is at least an appearance of brutality, and, we believe much unnecessary pain inflicted, when the spermatic cord (the vessels and the nerve) is *tightly* compressed between the two pieces of wood, as in a powerful vice, and left there either till the testicles drop off, or is removed on the following day by the operation. To the practice of some, of *twitching* their colt at an early period, sometimes so early as a month, we have stronger objections. When the operation of twitching is performed, a small cord is drawn as tightly as possible round the bag, between the testicle and the belly; the circulation is thus stopped, and in a few days the testicles and the bag drop off; but the animal suffers sadly,—it is occasionally necessary to tighten the cord on the second or third day, and inflammation and death have frequently ensued.

Docking.—The shortening of the tail of the horse is an operation which fashion and the convenience of the rider require to be performed on most of those animals. The length of the dock or stump, is a matter of mere caprice. To the close cropped tail of the wagon horse, however, we decidedly object, from its perfect ugliness, and because the animal is deprived of every defence against the flies. The supposition that the blood which should have gone to the nourishment of the tail, causes greater developement and strength in the quarters, is too absurd to deserve serious refutation. It is the rump of the animal being wholly uncovered, and not partly hidden by the intervention of the tail, that gives a false appearance of increased bulk.

The operation is simple. That point is searched out which is nearest to the desired length of tail. The hair is then turned up

and tied round with tape for an inch or two above this joint; and that which lies immediately upon the joint is cut off. The horse is then fettered with the side line, and the operator with his docking machine, or carving knife and mallet, cuts through the tail at one stroke. Considerable bleeding now ensues and frightens the timid or ignorant; but if the blood were suffered to flow on until it ceased of its own accord, the colt, and especially if he were very young, would rarely be seriously injured. As, however, the bleeding would occasionally continue for some hours, and a great quantity of blood would be lost, and the animal would be somewhat weakened, it is usual to stop the bleeding by the application of a red hot iron to the stump. A large hole is made in the centre of the iron that the bone may not be seared, as that might occasion it to drop off at the joint above, and thus shorten the dock. The iron rests on the muscular parts round the bone, and is brought into contact with the bleeding vessels, and very speedily stops the blood. Care should be taken that the iron is not held too long or too forcibly on the part, for many more horses would be destroyed by the application of the cautery than by the bleeding being left to its own course. Powdered resin sprinkled on the stump, or indeed any other application, is worse than useless; it causes unnecessary irritation, and sometimes extensive ulceration; but if the simple iron be moderately applied, the horse may go to work immediately after the operation, and no dressing will be required. If a slight bleeding should occur after the application of the cautery, it is much better to let it alone than to run the risk of inflammation or lock-jaw by re-applying the iron with greater severity.

Some people dock their colts a few days after they are dropped. This is a commendable custom on the score of humanity; no colt was ever lost by it, and we do not believe that the growth of the hair or the beauty of the tail is in the least impaired.

Nicking and Pricking.—The barbarous operation of nicking has been long sanctioned by fashion, and the breeder and the dealer must have recourse to it, if he would obtain a ready sale for his colts. It is not, however, practised to the extent that it used to be, nor attended by so many circumstances of cruelty.

There are three sets of muscles belonging to the tail, one raising, another depressing it, and a third set giving it a side motion in every direction, when acting singly, or very powerfully lowering it, when acting together. It would seem that the depressor and lateral muscles are much more powerful than the erector muscles, and that when the horse is undisturbed, the tail is bent down close to the buttocks; but when he is excited, and particularly when he is at speed, the erector muscles are called into action,

the tail is elevated, and there is given to him an appearance of energy and spirit which adds materially to his beauty. To perpetuate this character of fire, the operation of *nicking* was contrived. The depressor muscles and part of the lateral ones are cut through; and the erector muscles are left without any antagonists, and keep the tail in a position more or less erect, according to the whim of the operator, or the depth to which the incisions into the muscles have been carried.

The operation is thus performed. The side line is put on the horse, or he is put into stocks. The hair at the end of the tail is securely tied together for the purpose of afterwards attaching a weight to it. The operator then grasps the tail in his hand, and lifting it up, feels for the centre of one of the bones (the prominences at the extremities will guide him to this), from three to four inches from the root of the tail, according to the size of the horse. He then with a sharp knife divides the muscles deep from the edge of the tail on one side to the centre, and continuing the incision across the bone of the tail, he makes it as deep on the other side. One continued incision, steadily yet rapidly made, will accomplish this. If he be a blood horse, this will be sufficient. For a hunter two incisions are usually made, the second being about two inches below the first, and likewise as nearly as possible in the centre of one of the bones; the reason of which is, that the incision in order perfectly to divide the muscles that bring down the tail, must be so deep in the neighbourhood of a joint as not to injure the ligament which ties the bones together, or the substance which is interposed between the joints, and thus by destroying the joint to render the tail deformed.

On a hackney, a third incision is made ; for fashion has decided that his tail shall be still more elevated and curved. Two incisions only are made in the tail of a mare, and the second not very deep.

When the second incision is made, some fibres of the muscles between the first and second incisions, will project into the wounds, and which must be removed with a pair of curved scissors. The same must be done with the projecting portions from between the second and third incisions ; and the wounds should be carefully examined, to ascertain that the muscles have been equally divided on each side, otherwise the tail will be curved awry. This being done, pledgets of tow must be introduced deeply into each gap, and confined, but not too tightly, by a bandage. A very profuse bleeding will alone justify any tightness of bandage ; and the ill consequences which have resulted from nicking are mainly attributable to the unnecessary force which is used in confining these pledgets. Even if the bleeding immediately after the operation should have been very great, the roller

must be loosened in two or three hours, otherwise swelling and inflammation, or death, may possibly ensue. Twenty four hours after the operation, the bandage must be quite removed; and then all that is necessary, as far as the healing of the wounds is concerned, is to keep them clear.

If, however, the tail were suffered to hang down, the divided edges of the muscles would come again in contact with each other, and close; the natural depression of the tail would remain, and the animal would have been punished for no purpose. The wounds must be kept open, and that can only be accomplished by forcibly keeping the tail curved back, for two or three weeks. For this purpose a cord one or two feet in length, is affixed to the end of the hair, which terminates in another divided cord, each division going over a pully on either side of the back of the stall, a weight is hung at either extremity sufficient to keep the incisions properly open, and regulated by the degree in which this is wished to be accomplished. The animal will thus be retained in an uneasy position, although after the first two or three days, probably not one of acute pain. It is barbarous to increase this uneasiness or pain, by affixing too great a weight to the cords; for it should be remembered, that the proper elevated curve is given to the tail *not by the weight keeping it in a certain position for a considerable time*, but by the depth of the first incisions, and the degree in which the wounds are kept open. By every ounce of weight beyond that which is necessary to keep the incisions open, unnecessary suffering is inflicted. Some practitioners use only one pulley; others do not use any, but put on a light girth, and tie a cord from the end of the tail to the girth, bending it over the back. The double pulley, however, is the least painful to the horse, and more perfectly secures the proper elevation and straight direction of the tail.

The dock should not, for the first three or four days, be brought higher than the back; dangerous irritation and inflammation would be produced. It may after that be gradually raised to an elevation of forty-five degrees. The horse should be taken out of the pulleys, and gently exercised once or twice every day; but the pulleys cannot finally be dispensed with until a fortnight after the wounds have healed, because the process of contraction, or the approach of the divided parts, goes on for some time after the skin is perfect over the incisions, and the tail would thus sink below the desired elevation.

If the tail has not been unnecessarily extended by enormous weights, no bad consequences will usually follow; but if considerable inflammation should ensue, the tail must be taken from the pulley and diligently fomented with simple warm water, and a dose of physic given. Lock-jaw has in some rare instances fol-

lowed, under which the horse generally perishes. The best means of cure in the early state of lock-jaw is to amputate the tail at the joint above the highest incision. In order to prevent the hair from coming off, it should be unplatted and combed out every fourth or fifth day.

The operation of pricking is in all respects the same as nicking, except that in pricking, the knife is introduced and the ligaments severed without dividing the skin. In this case, heavier weights will be necessary, and the tail should be raised more over the horse's back.

General Management of the Horse.—This is a very important subject, even as it regards the farmer, although there are comparatively few glaring errors in the treatment of the agricultural horse. We shall consider the most important points of general management, under several heads.

Air.—A supply of pure air is necessary to the existence and health of man and beast. In some instances, the supply, if not too great, is carelessly and injudiciously admitted, for the wind blows in from every quarter and beats directly upon the animal. When he has been well seasoned to this, it seems to do him little harm, except that he has an unthrifty coat, and is out of condition. The common error, however, is to exclude as much as possible every breath of air, and to have the atmosphere of the stable hot, contaminated, and unwholesome. The effect of several horses being shut up in the same stable, is to render the air unpleasantly hot. A person coming from without cannot breathe it many minutes without profuse perspiration. The horse stands hour after hour in it, and sometimes clothed; and then his covering is suddenly stripped off, and he is led into the open air, the temperature of which is thirty or forty degrees below that of the stable. Putting the humanity of the thing for a moment out of the question, we ask, must not the animal thus unnaturally and absurdly treated, be subject to rheumatism, catarrh, and inflammation of the lungs?

It is not so generally known as it ought to be, that the return to a hot stable, is quite as dangerous as the change from a heated atmosphere to a cold and biting air. Many a horse that has travelled without harm over a bleak country, has been suddenly seized with inflammation and fever, when he has immediately, at the end of his journey, been surrounded with heated and foul air. It is the sudden change of temperature, whether from heat to cold, or from cold to heat, that does the mischief, and yearly destroys a multitude of horses.

If the stable is close, the air will not only be hot but foul. The breathing of every animal contaminates it; and when in the

course of the night, with every aperture, even the key hole, stopped, it passes again and again through the lungs, the blood cannot undergo its proper healthy change ; digestion cannot be so perfectly performed, and all the functions of life are injured.

The air of the improperly close stable is still further contaminated by the urine and dung, which rapidly ferment in the heat, and give out stimulating and unwholesome odours. Nothing can be more certain than that the majority of the maladies of the horse, and those of the worst and most fatal character, are directly or indirectly to be attributed to the unnatural heat of the stable, and the sudden change of the animal from a high to a low, or from a low to a high temperature.

Litter.—This should be frequently removed. The early extrication of gas shows the rapid putrefaction of the urine ; and the consequence of which will be the rapid putrefaction of the litter that has been moistened by it. Every portion of the litter that has been much wetted or at all softened by the urine, and is beginning to decay, should be swept away every morning ; the greater part of the remainder may be piled under the manger, a little being left to prevent the painful and injurious pressure of feet on the hard pavement during the day. The soiled and macerated portion of that which was left should be removed at night.

No heap of fermenting dung should be suffered to remain during the day, in the corner or in any part of the stable.

The stable should be so contrived, that the urine shall run quickly off, and the offensive and injurious vapour from the decomposing urine and the litter will thus be materially lessened. But care should be taken that the slanting of the floor of the stable shall be no more than sufficient to draw off the urine with tolerable rapidity, as the direction of the floor of the stalls is often a cause of the contraction of the heels of the foot.

Humanity and interest as well as the appearance of the stable, will induce the general proprietor of the horse, to place a moderate quantity of litter under him during the day. The farmer who wants every otherwise useless substance converted into manure, will have additional reasons for adopting this practice.

Light.—This neglected branch of stable management, is of far more consequence than is generally imagined. The farmer's stable is frequently destitute of any glazed windows ; and has only a shutter, which is open in warm and closed in cold weather. When the horse is in the stable only a few hours of the day, this is not of so much consequence ; nor of so much probably to horses of slow work ; but to carriage horses and hackneys, so far at least as the eyes are concerned, a dark stable is little less injurious than a foul and heated one. A degree of light some-

what approaching to that of day, and not too glaring, should be contrived to be admitted.

Grooming.—Of this much need not be said, since custom, and apparently without ill effect, has allotted so little of the comb and the brush to the farmer's horse. The animal that is worked all day, and turned out at night, requires little more to be done to him than to have the dirt brushed off his limbs. Regular grooming, by rendering his skin more sensible to the alteration of temperature, and the inclemency of the weather, would be prejudicial. The horse that is altogether turned out, needs no grooming: the dandriff or scurf which accumulates at the roots of the hair, is a provision of nature to defend him from the wind and the cold.

It is to the stabled horse highly fed, and little or irregularly worked, that grooming is of so much consequence. Good rubbing with the brush or the curry-comb, *opens the pores of the skin*, and circulates the blood to the extremities of the body, and through the minute vessels of the skin, and produces free and healthy perspiration, and stands in the room of exercise. No horse will carry a fine coat without either heat or dressing; when the weather will permit, this operation should always be performed without doors, and not in the stable.

Exercise.—Our observations on this important branch of stable management, must have only slight reference to the agricultural horse. His work is usually regular and not exhausting. But for those who contrive to keep a horse for business, or pleasure, the rule we would lay down is, that every horse should have daily exercise. The horse that with the usual stable feeding, stands idle for three or four days, must suffer. He is disposed to fever or to grease, or most of all, to diseases of the foot; and if, after these three or four days of inactivity, he is ridden fast and far, is almost sure to have inflammation of the lungs, or of the feet; and to keep him free from these diseases, he should have two hours' exercise every day.

Exercise should be somewhat proportioned to the age of the horse. A young horse requires more than an old one. Nature has given to young animals of every kind a disposition to activity, but the exercise must not be violent. A great deal depends upon the manner in which it is given. To preserve the temper and to promote health, it should be moderate, at least at the beginning and termination. The rapid trot or even the gallop may be resorted to in the middle of the exercise, but the horse must be brought in cool.

Food.—The system of manger feeding is becoming general among farmers. There are few horses who do not habitually waste a portion of their hay, and by some the greater part is pulled down and trampled under foot, in order first to cull the

sweetest and best locks, and which could not be done while the hay was inclosed in the rack. A good feeder will afterwards pick up much of that which was thrown down, but some of it must be soiled and rendered disgusting, and, in many cases, one third of this division of their food is wasted. Some of the grain is imperfectly chewed by all horses, and scarcely at all by hungry and greedy ones. The appearance of the dung will sufficiently evince this.

The observation of this induced the adoption of manger-feeding, or of mixing a portion of chaff with the grain. By this means the animal is compelled to chew his food: he cannot to any great degree, bolt the straw or hay; and while he is forced to grind that down, the grain is ground with it, and yields more nourishment, the stomach is more slowly filled, and therefore acts better on its contents, and is not so likely to be overloaded; and the increased quantity of saliva thrown out in the lengthened grinding of the food, softens it, and renders it more fit for digestion.

If, when considerable provender was wasted, the horse maintained his condition, and was able to do his work, it was evident that much might be saved to the farmer, when he adopted a system by which the horse ate all that was set before him; and by degrees it was found out that even food somewhat less nutritious, but a deal cheaper, and which the horse either would not eat, or would not properly grind down in its natural state, might be added, while the animal would be in quite as good plight and always ready for work.

Chaff may be composed of equal quantities of clover or meadow hay, and wheaten, oaten, or barley straw cut into pieces of a quarter or half an inch in length, and mingled well together; the allowance of grain is afterwards added and mixed with the chaff. Many farmers very properly bruise the oats or corn. The whole grain is apt to slip out of the chaff and be lost; but when it is bruised, and especially if the chaff is a little wetted, it will not readily separate; or should a portion of it escape the grinders, it will be partly prepared for digestion by the act of bruising. The prejudice against bruising the oats is, so far as the farmer's horse, and the wagon horse, and every horse of slow draught is concerned, altogether unfounded. The quantity of straw in the chaff will always counteract any supposed purgative quality in the bruised oats. Horses of quicker draught, unless they are naturally disposed to scour, will thrive better with bruised than with whole oats; for a greater quantity of nourishment will be extracted from the food, and it will always be easy to apportion the quantity of straw to the effect of the mixture on the bowels of the horse. The principal alteration which should be

CHAPTER III.

DISEASES OF THE HORSE.

IN entering on this division of our subject, we would premise that it is impossible for us to give the farmer such an account of the nature and treatment of the diseases of horses, as will enable him with safety to practise for himself, except in the commonest cases. The causes of most diseases are so obscure, the symptoms so variable, and their connection with other maladies so complicated and mysterious, that a life devoted to professional study will alone qualify a man to become a judicious and successful practitioner on the diseases of the horse and other domestic animals. Our object will be to communicate sufficient instruction to the farmer to enable him to act with promptness and judgment when he cannot obtain professional assistance, to qualify him to form a satisfactory opinion of the skill of the veterinary surgeon whom he may employ, and more especially, to divest him of those strange and absurd prejudices, which in a variety of cases not only produce and prolong disease, but bring it to a fatal termination.

INJURIES AND DISEASES OF THE SKULL, THE BRAIN, &c.—The skull of the horse is so defended by the hardness of the parietal bones (*the roof of the cavity which contains the brains*), and those bones are so covered by a mass of muscle, and protected above by an additional layer of bone, that a fracture of the bones of the skull is almost impossible, except from brutal violence. When, however, it does occur, it is almost invariably fatal. We proceed then to the diseases of the head.

Megrims.—Megrims result from an unusual flow or determination of blood to the brain. They may be occasioned in various ways. The most usual cause is violent exercise in a hot day, and the horse being fat and full of blood, more than the usual quantity will be sent to the head. It comparatively rarely happens when the horse is ridden; but should he be driven, and, perhaps, rather quickly, he may perform a part of his journey with his usual cheerfulness and ease, when all at once he will stop, shake his head, be evidently giddy, and half unconscious.

In a minute or two, this will pass over, and he will go on again as if nothing had happened.

Frequently, however, the attack will be of a more serious nature. He will fall without the least warning, or suddenly run round once or twice and then fall. He will either lie in a state of complete insensibility, or struggle with the utmost violence. In five or ten minutes he will begin gradually to come to himself; he will get up and proceed on his journey, yet somewhat dull, and evidently affected and exhausted by what has happened, although not seriously or permanently ill.

This is a very dangerous disease. Dangerous to the horse, which will occasionally die on the spot, and dangerous to those who drive, for there will be frequently no warning or opportunity to escape. A horse once attacked, is very subject to a return of the complaint.

At the moment of attack, a person who is able to bleed should take three or four quarts of blood from the neck. The driver should pat and soothe the animal, and carefully examine the harness, and pursue his journey as gently as circumstances will permit. When he gets home, a dose of purgative medicine should be administered, if the horse can be spared, and the quantity of dry food lessened, and mashes given, or the animal turned out altogether for two or three months.

Apoplexy.—This is a more violent attack of the disease just mentioned (pressure of blood on the brain). The horse falls and dies at once. When there is notice of this disease, which there generally is, the horse being seen with his head low, extended almost to the ground, he staggers as he stands. If moved he appears as if he would fall. His sight and hearing are evidently affected. He will continue in this way sometimes from one hour to twelve. He then falls, grinds his teeth, &c.

If there be time for medical treatment, the course to be pursued is plain enough. Bleed copiously, take at once eight or ten quarts. Bleed from a vein, in preference to an artery, for an artery which supplies the brain cannot be got at. Bleed from the jugular or common neck vein, for that returns the blood from the brain. Next give an injection; if that cannot conveniently be done, back-rake or remove the dung from the lower intestines with the hand, and give a strong dose of physic; but the case is most usually hopeless, and the most decided and skilful treatment alone can avail.

Stomach Staggers.—A disease not much unlike this is known under the name of *staggers*. There are two varieties of it. The sleepy or stomach staggers, and the mad staggers. Frequently, however, they are only stages of the same disease, or varying with the cause that produced them. In *stomach staggers* the

horse stands dull, sleepy, staggering; when roused he looks vacantly round him; perhaps seizes a lock of hay and dozes again with it in his mouth; at length he drops and dies, or the sleepiness passes off and delirium comes on, when he falls, rises again, drops, beats himself about, and dies in convulsions. The cause of this is sufficiently evident. It arises from over feeding, or improper food.

We have little to say of the treatment of this disease, so far as medicine is concerned. Bleed very largely; that can do no harm, and in mad staggers is indispensable. Give a good dose of physic (by physic whenever the word occurs in this part of the book we mean purgative medicine)—*that* also can do no harm; although in stomach staggers it cannot do much good. Keeping the horse from all food will be a very proper proceeding, whichever be the disease.

If little can be said in the way of treatment of stomach staggers, much might be said of its prevention. The cause will generally be found to be too voracious feeding; too much food given at once, and perhaps without water, after hard work and long fasting. Nothing is lost by the habitual use of *the nose-bag*, and a more equal division of the hours of labour and times of feeding. One consequence of such improper treatment is, that a horse that has frequent half attacks of staggers often goes blind.

Mad Staggers—(inflammation of the brain, brain fever,) can hardly, at first, be distinguished from the sleepy or stomach staggers; but after a while the horse suddenly begins to heave at the flanks, his nostrils expand, his eyes unclose, he has a wild and vacant stare, and delirium comes rapidly on.

Over exertion, when the horse is too fat or full of blood, or especially during hot weather, is a frequent cause of inflammation of the brain, but whatever will produce general fever, may be the cause of mad staggers.

The treatment adopted by the best practitioners is too often unsuccessful. The horse should be bled until he faints or drops, or if he be down until he is evidently faint and weak. Both the neck veins should be opened at once, and the fullness of the stream, or the quickness with which it is taken, is almost as important as the quantity. Physic should then be given. The purge that acts most quickly is the best, and that is the croton nut, powdered at the time and given in the drink, in the dose of half a drachm, and followed in smaller doses of ten grains each, every six hours, with plenty of injections of warm soap and water until the bowels are well opened.

Tetanus or Locked-jaw.—This is one of the most fatal diseases to which the horse is subject. It is called *locked-jaw*, because the muscles of the jaw are earliest and most powerfully affected.

Tetanus is a constant spasm of all the voluntary muscles, and particularly of the neck, the spine, and the head. It is generally slow and very treacherous in its attack. The horse for a day or two does not appear to be quite well ; he does not feed as usual, partly chews his food and drops it, and gulps his water. The owner at length finds out that the motion of the jaw is considerably limited, and some saliva is drivelling from the mouth. If he tries the mouth, he can open it only a little way, or the jaws are perfectly and rigidly closed, and thus the only time in which the disease could be successfully combated, is lost.

Locked-jaw generally arises from a wound, and oftenest a wound of a tendinous or ligamentous part ; but depending not either upon the extent of the wound or the degree of inflammation which may be excited. Exposure to cold or a pelting storm, is a frequent cause.

The rational method of cure would seem to be, first to remove the local cause; but this will seldom avail much. If it be a wound in the foot, let it be touched with the hot iron or the caustic, and kept open with digestive ointment. The new irritation thus produced, may lessen or remove the old one. If it follows nicking or pricking, let the incision be made deeper, and stimulated by digestive ointment; and if it arises from docking, let the operation be repeated higher. In treating the constitutional disease efforts must be made to tranquilize the system, and the most powerful agent is bleeding. We have known twenty pounds of blood taken at once, and with manifest advantage. There is not a more powerful means of allaying general irritation. Temporary relaxation of the spasm will at last follow, and that will give the opportunity to do another thing in order to reduce and quiet the disturbed system, and that is to give physic. Here, again, that physic is best which is speediest in operation, and will lie in the smallest compass. The croton has no rival in this respect. The first dose should be a half drachm, and the medicine repeated every six hours, in doses of ten grains until it operates. The bowels in all these nervous affections are very torpid, and there is little danger of inflammation from an over dose of physic. The operation of physic may be assisted by frequent injections, each containing a drachm of aloes dissolved in warm water.

Then, as it is a diseased action of the nerves, proceeding from the spinal marrow, the whole of the spine should be blistered, three or four inches wide. The horse should be placed in a warm stable, yet with pure air, and should be clothed with two or three additional rugs, or, what is much better, sheep skins warm from the animal, with the raw side inward, and changed as soon as they become dry or putrid.

Having bled largely and physicked and blistered, we seek for other means to lull the irritation, and we have one at hand, small in bulk and potent in energy—opium. Give at once a quarter of an ounce reduced to powder and made into a drink with gruel or in a small ball, (in its crude state it would be too long dissolving in the stomach,) and give an additional drachm every six hours. If the jaw should be quite fixed, administer it in injections. The bowels must be attended to during the exhibition of the opium, and aloes given in small doses, to keep them in a lax state.

Palsy.—This in the horse is usually confined to the hinder limbs. Bleeding, physic, antimonial medicines, and stimulating embrocations, are the most likely means of cure.

Diseases of the Nose and Mouth.—*Nasal gleet* is an increased, thicker, and unnatural discharge of fluid from the nose. If the discharge be not offensive to the smell nor mixed with any matter, it is probably merely an increased and somewhat vitiated secretion, and will frequently yield to small doses of blue vitriol, from one to two drachms, and given twice in the day.

Glanders.—This is a more formidable disease. That which would be considered as the earliest and an unquestionable symptom of the glanders, would be an increased discharge from one or both nostrils of a glutinous sticky matter, which when rubbed between the fingers, has a peculiar clammy, bird-limy feel. This discharge, in cases of infection, may continue, and in so slight a degree as to be scarcely perceptible for many weeks or months, before the health and capabilities of the horse seem to be injured. In process of time, however, pus mingles with the discharge, and the neighbouring glands become affected, and if there be discharge from both nostrils, the glands within the under jaw will be on both sides enlarged. If the discharge be from one nostril only, the swelled gland will be found on that side alone. The membrane of the nose will assume a dark purplish hue, or almost leaden colour, or any shade between the two. Spots of ulceration will probably appear on the membrane covering the cartilage of the nose, and when these appear there can be no doubt about the matter.

Glanders may be either bred in the horse or communicated by contagion. Improper stable management we believe to be a far more frequent cause than contagion, They may be produced by any thing that injures, or for a length of time acts upon and weakens, the vital energy of the membrane of the nose. It is not only from bad stable management, but from the hardships which they endure, and exhausted state of the constitution, that horses are subject to this disease.

Glanders, however, are highly contagious. They are commu-

nicated by the air or breath, but if the purulent matter discharged from the nostrils be rubbed on a wound, or on a mucous surface, or the nostrils, it will produce the disease. All contact, therefore, with a glandered horse, should be avoided.

We would deeply impress it on the mind of the farmer, that no glandered horse should be employed on his farm in any kind of work, or be permitted to remain for a day on his premises. He may be capable of work for years after the disease has become undoubted, but mischief may be so easily and extensively effected, that the public interest demands that every infected animal should be summarily destroyed, or given over for experiment to a veterinary surgeon.

Our opinion of the treatment of glanders is implied in what we have just stated. We view all supposed cures with suspicion. As for medicine there is scarcely a drug to which a fair trial has not been given, and yet all have been in the end abandoned.

No fact is more certain than that he who will keep a glandered horse in his stable, or works him in his team, will sooner or later lose the greater part of his horses. However, the generation of the disease may certainly be much prevented, and the first and most effectual mode of prevention, will be to keep the stables cool and well ventilated, for the hot and poisoned air of low and confined stables, is one of the most prevalent causes of glanders.

Farcy.—Farcy is intimately connected with glanders; they will run into each other, or their symptoms will mingle together, and before either arrives at its fatal termination, its associate will almost invariably appear. There is, however, a very material difference in their symptoms and process, and this most important of all, that while glanders are generally incurable, farcy in its early stage and mild form may be successfully treated.

The first indication of this disease, is generally the appearance of little tumours—*farcy buds*—close to some of the veins, following the course of the veins and connected together by a kind of cord, which farriers call corded veins. When they are few and small they may possibly exist for several weeks without being observed; but at length they increase in number and in size, and become painful and hot, and some of them begin to ulcerate. They appear usually about the face, neck, or inside of the thigh, and in the latter case there is some enlargement of the limb and lameness.

Farcy, like glanders, springs from infection or from bad stable management. It is produced by all the causes which give rise to glanders, but with this difference, that it is more frequently generated, and is sometimes strangely prevalent in particular districts.

The treatment of farcy varies with the form it assumes. In the button or bud farcy, a mild dose of physic should be first

administered. The buds should then be carefully examined, and if any of them have broken, the budding iron (of a dull red heat) should be applied to them, or if matter should be felt in them, showing that they are disposed to break, they should be penetrated with the iron. These wounds should be daily inspected, and if when the slough of the cautery comes off, they look pale and foul, and spongy, and discharge a thin matter, they should be frequently washed with a lotion compound of a drachm of corrosive sublimate dissolved in an ounce of rectified spirits. The other buds should likewise be examined, and opened with the iron as soon as they evidently contain matter. As, however, the constitution is now tainted, local applications will not be sufficient, and the disease must be attacked by internal medicines as soon as the physic has ceased to operate. The corrosive sublimate will be the best alternative, and may be given in doses of two grains, gradually increased to a scruple, with two drachms of gentian and one of ginger, and repeated morning and night until the ulcers disappear, unless the horse is violently purged or the mouth become sore, when a drachm of blue vitriol may be substituted for the corrosive sublimate. During this time the horse should have free circulation of air, and green food or carrots (the latter more particularly) should be given him, with a fair allowance of grain. If he could be turned out during the day it would be advantageous, but at all events he should be thoroughly exercised.

Lampas.—Some of the lower bars of the palate occasionally swell and rise to a level with, and even beyond the edge of the teeth, and they are very sore, and the horse feeds badly on account of the pain he suffers from the pressure of the food on the bars. This is called the *lampas.*

In the majority of cases the swelling will soon subside without medical treatment, or a few mashes and general alteratives will relieve the animal.

Diseases of the Tongue.—Bladders will sometimes appear along the under side of the tongue, which will increase to a considerable size, and the tongue itself will be much enlarged, and the animal will be unable to swallow, and a great quantity of ropy saliva will drivel from his mouth. If the mouth of the horse is opened, one large bladder or a succession of bladders of a purple hue, will be seen to extend along the whole of the under side of the tongue. If they be lanced freely and deeply from end to end, the swelling will very rapidly abate, and any little fever that remains may be subdued by cooling medicine.

Burnt Tongue.—This is considered an epidemic. It first appears like a blister upon the tongue, or in thick patches upon the lips. The animal appears sluggish, dull, and eats hay with difficulty; sometimes they refuse all nourishment, and seem

averse to drinking. Water whether cold or warm, when drank brings on an ague fit, and they tremble and shiver exceedingly. Some horses have been attacked in the feet, a swelling and eruption commences at the top of the hoof, accompanied with evident pain and soreness.

The treatment of black tongue is simple. Let some decided cathartic medicine be administered, and the mouth of the horse occasionally washed with a solution of honey and saltpetre in vinegar. The diet of the horse should be particularly attended to: hay and dry food being irritating to the parts, should be avoided. Bran, Indian meal, and ground oats mixed with water so as to make it sloppy and capable of being drank, may be allowed him.

The Strangles.—This is principally a disease incidental to young horses, usually appearing between the fourth and fifth years. It is preceded by cough, and can at first be scarcely distinguished from common cough, except that there is more discharge from the nostril, of a yellowish colour, mixed with matter, but generally without smell; and likewise a considerable discharge of ropy matter from the mouth, and greater swelling than usual under the throat. This swelling increases with uncertain rapidity, accompanied by some fever and disinclination to eat, partly arising from the fever, but more from the pain the animal feels in the act of chewing. There is considerable thirst, but after a gulp or two, the horse ceases to drink, yet is ardently desirous of more. In the attempt to swallow, and sometimes when not drinking, a convulsive cough comes on, which almost threatens to suffocate the animal; and thence, probably, the name of the disease. The tumour is about the centre of the channel of the under jaw; it soon fills the whole space, and is evidently one uniform body; and may thus be distinguished from glanders, or the enlarged glands of catarrh. At length the centre of it becomes more prominent and soft, and evidently contains fluid. This rapidly increases, the tumour bursts, and a great quantity of pus is discharged. As soon as the tumour has broken the cough subsides, and the horse speedily mends.

The treatment is very simple. As the essence of the disease consists in the formation and suppuration of the tumour of the under jaw, the principal, or almost the sole attention, should be directed to the hastening of these processes. Therefore as soon as the tumour of strangles evidently appears, the part should be actively blistered. As soon as the swelling is soft on the top, and evidently contains matter, it should be deeply and freely lanced. If the incision is deep and large enough, no second collection of matter will be found.

Poll Evil.—From the horse rubbing and sometimes striking

his poll against the lower edge of the manger, or hanging back in the stall, and bruising the part with the halter, or from some other cause, inflammation comes on, and a swelling appears on the neck, hot, tender, and painful.

The first thing to be attempted is to abate the inflammation by bleeding, physic, and the application of cold lotions to the part. By this means the tumour will sometimes be dispersed. If the swelling increases, and the heat and tenderness likewise increase, matter will form in the tumour, and then our object will be to hasten its formation by warm fomentations, poultices, &c. As soon as the matter is formed, it should be evacuated, and now comes the whole of the art of treating pole evil; *the opening of the tumour must be so contrived that all the matter shall come out*, and continue afterwards to run out as it is formed, and not collect at the bottom of the ulcer, irritating and corroding it. This can be effected by a seton alone. The needle should enter at the top of the tumour, penetrate through its bottom, and be brought out at the side of the neck, a little below the abscess, without any thing more than this, except frequent fomentations with warm water to keep the part clean, and to obviate inflammation. Pole evil, in its early stage, will generally be cured.

Diseases of the Chest, Heart, and Lungs.—When the saddle has been suffered to press long on the withers, a tumour will be formed, hot and exceedingly tender. It may be treated in the same manner as the pole evil.

The muscles of the breast are occasionally the seat of a singular and somewhat mysterious disease. There is tenderness and occasional swelling, and after a while the muscles of the chest waste considerably. We believe it to be nothing more than rheumatism, produced by suffering the horse to remain too long tied up, and exposed to the cold, or riding him against a very bleak wind. Sometimes a considerable degree of fever accompanies this; but bleeding, physic, a rowel in the chest, warm embrocation over the parts affected, warm stabling, and warm clothing, with doses of a drachm or two of antimonial powder, will soon subdue the complaint.

Dropsy of the Skin of the Chest.—Dropsical swellings often appear between the fore leg and in the chest. They are effusions of fluid underneath the skin, they accompany various diseases, particularly when the animal is weakened by them, and sometimes appear when there is no other disease than the debility, which in the Spring and Fall of the year accompanies the changing of the coat. The treatment will vary with the cause of the affection or the accompanying disease. Small punctures with the lancet will seldom do harm; friction of the part if it can be borne

will be serviceable, mild exercise should be used; diuretics given mixed with some cordial, with liberal food, as carrots, and occasionally a mild dose of physic, and that followed by tonics and cordials with diuretics. The vegetable tonics, as gentian and columbo, with ginger, will be most effectual.

The Heart.—The heart is subject to disease. It powerfully sympathises with the malady of every part. An injury of the foot will speedily double the quickness of the beatings or pulsations of the heart. It sometimes is inflamed without previous affection of any other part. This is not a frequent but a most dangerous disease, and is characterised by a pulse quick and strong, and a bounding action of the heart that may occasionally be seen at the side, and is heard at the distance of several yards. There is also a peculiar alertness and quickness in every motion of the animal, and an energy of expression in the countenance exceedingly remarkable. Speedy and copious bloodletting will alone avail to save the horse; for the heart overexcited, and called on to perform this double work, must soon be exhausted.

The pulse is a very useful assistant in ascertaining either the seat or degree of ailment or pain of the horse. The number of pulsations in every artery will give the number of beatings of the heart, and so express the irritation of that organ, and of the frame generally. In a state of health, the heart beats in the farmer's horse, about thirty-six times in a minute. In the smaller, and in the thorough bred horse, the pulsations are forty or forty-two. This is said to be the standard pulse—the pulse of health. It varies very little in horses of the same size and breed; and where it is found, there can be little materially wrong. The most convenient place to feel the pulse, is at the lower jaw, a little behind the spot where the submaxillary artery and vein, and the parotid duct, comes from under the jaw. There the number of pulsations will be easily counted, and the character of the pulse, a matter of fully equal importance, will be clearly ascertained. Many horsemen put the hand to the side. They can certainly count the pulse there, but they can do nothing more. We must be able to press the artery against some hard body, as the jaw-bone, in order to ascertain the manner in which the blood flows through it, and the quantity that flows.

Inflammation.—Local inflammation is characterised by redness, swelling, heat, and pain. We have spoken of some of these local inflammations, and shall speak of others. The treatment will, in some degree, vary with the part attacked, and the degree of inflammation; but it will necessarily include the following particulars:

If the inflammation consist of increased flow of blood to, and through the part, the ready way to abate it, is to lessen the quantity of blood. All other means are comparatively unimportant, compared with *bleeding*.

Next in importance to bleeding, is purging. Something may be removed from the bowels, the retention of which would increase the general irritation and fever. The blood will be materially lessened, and while the purging continues, there is some degree of languor and sickness felt; and the force of the circulation is thereby diminished, and the general excitement lessened. The farmer will therefore see the importance of physic, in every case of considerable external inflammation.

In cases of internal inflammation, much judgment is required to determine when a purgative may be beneficial or injurious. In inflammation of the lungs or bowels, it should never be given.

The means of abating external inflammation, are various and seemingly contradictory. The foot laboring under inflammation, is put into cold water, or the horse is made to stand in water or wet clay; and various cold applications are used to sprains.

Sometimes, however, we resort to warm fomentations, and if benefit be derived from their use, it is to be traced to the warmth of the fluid, and not to any medicinal property in it; and warm water will do as much good to the horse which has too thick a skin, as any nostrum that the farrier may recommend. Fomentations, to be useful, should be long and frequently employed, and at as great a degree of heat as can be used without giving the animal pain.

It is often difficult to decide when a cold or a hot application is to be used; and no general rule can be laid down, except that in cases of superficial inflammation, and in the early stages, cold lotions will be preferable; but when the inflammation is deeper seated, or fully established, warm fomentations may be most serviceable.

Fever.—Fever is generally increased arterial action, either without any local affection, or in consequence of inflammation in some particular part.

The first is pure fever. Some have denied that it exists with the horse; but they must have been strangely careless observers of the diseases of that animal.

It begins frequently with a cold, or shivering fit, although this is not essential to fever. The horse is dull, unwilling to move, with a staring coat, and cold legs and feet. This is succeeded by warmth of the body. The animal will scarcely eat, and is very costive.

What we have said of the treatment of local inflammation, will sufficiently indicate that which we should recommend in fever.

Bleeding, regulating the quantity of blood taken by the degree of fever, and keeping the bowels gently open, should therefore be adopted. The horse should be warmly clothed, but placed in a cool and well ventilated stable.

Bleeding.—This operation is performed with a fleam or lancet. The first is the commoner instrument, and the safest, except in skilful hands. A bloodstick, a piece of hard wood loaded at one end with lead, is used to strike the fleam into the vein. This is sometimes done with great violence, and the opposite side of the coat of the vein is wounded. Bad cases of inflammation have resulted from this. If the fist be doubled, and the fleam is sharp, and is struck with sufficient force with the lower part of the hand, the bloodstick may be dispensed with.

For general bleeding, the jugular vein is selected. The horse is blindfolded on the side on which he is to be bled, or his head turned well away; the hair is smoothed along the course of the vein with the wrist and finger; then with the third and little finger of the left hand, which holds the fleam, pressure is made on the vein sufficient to bring it fairly into view, but not to swell it too much, for thus presenting too round a surface, it would be apt to roll or slip under the blow. The point to be selected is about two inches below the union of the two portions of the jugular at the angle of the jaw. The fleam is to be placed in a direct line with the course of the vein, and over the precise centre of the vein, as close to it as possible, but its point not absolutely touching the vein. A sharp rap with the bloodstick or the hand on that part of the back of the fleam immediately over the blade, will cut through the vein, and the blood will flow. A fleam with a large blade should always be preferred, for the operation will be materially shortened, which will be a matter of much consequence with a fidgetty or restive horse; and a quantity of blood drawn speedily will have more effect on the system than double the weight slowly taken, while the wound will heal just as readily as if made by a smaller instrument. There is no occasion to press so hard against the neck with the pail as some do; a slight pressure, if the incision has been large enough, and straight, and in the middle of the vein, will cause the blood to flow sufficiently fast; or the fingers being introduced into the mouth, between the curbs and grinders, and gently moved about, will keep the mouth in motion, and hasten the rapidity of the stream, by the action and pressure of the neighbouring muscles.

When sufficient blood has been taken, the edges of the wound should be brought close and exactly together, and kept together by a small sharp pin being passed through them. Round this, a little tow or a few hairs from the mane of the horse should be wrapped, so as to cover the whole of the incision; and the head

of the horse should be tied up for several hours to prevent his rubbing the part against the manger. In bringing the edges of the wound together and introducing the pin, care should be taken not to draw the skin too much from the neck, otherwise blood will insinuate itself between the skin and the muscles, and cause an unsightly and sometimes troublesome swelling.

The blood should be received into a vessel, the dimensions of which are exactly known, so that the operator may be able to calculate, at every period of the bleeding, the quantity that is subtracted. Care likewise should be taken that the blood flow in a regular stream into the middle of the vessel, for if it be suffered to trickle down the sides, it will not afterwards undergo those changes by which we partially judge of the extent of the inflammation. The pulse, however, and the symptoms of the case collectively, will form a better criterion than any change in the blood. Twenty-four hours after the operation, the edges of the wound will have united, and the pin should be withdrawn. When the bleeding is to be repeated, if more than three or four hours have elapsed, it will be more prudent to make a fresh incision rather than open the old one.

Inflammation of the Lungs.—This is a disease to which the horse is especially liable, both from the impure air of the stable, and from the various exposures to which he is subjected. He who would have his horses free from disease, and especially disease of the lungs, must pursue two objects, coolness and cleanliness.

Inflammation of the substance of the lungs is sometimes sudden in its attack, but generally preceded by symptoms of fever. The pulse is occasionally not much increased in frequency, but oppressed and indistinct; the artery is plainly to be felt under the finger of its usual size, but the pulse no longer indicates the expansion of the vessel, as it yields to the gush of blood, and its contraction when the blood has passed; it is rather a vibration or thrill, communicated to a fluid already over-distending the artery. The extremities are cold; the nostril is expanded; the head is thrust out; and the flanks begin to heave. There is a peculiarity in the working of the flank. It is not the deep laborious breathing of fever, nor the irregular beating of broken wind, in which the air appears to be drawn in by one effort, while two seem to be necessary to expel it; but it is a quick hurried motion, evidently expressive of pain, or of some mechanical obstruction. The membrane of the nose is of an intensely florid red, the countenance is singularly anxious and indicative of suffering, and many a mournful look is directed to the flanks. The horse stands in a singular manner, stiff, with his fore legs abroad, that the chest may be expanded as much as possible, and he is unwil-

ling to move, lest for a moment he should lose the assistance of the muscles of the arms and shoulders, in producing that expansion; and for the same reason he obstinately stands up, day after day, and night after night, or if he lies down from absolute fatigue, it is but for a moment.

The duration of the disease is singularly uncertain. It will occasionally destroy in less than twenty-four hours, but more frequently it lasts a little longer.

The treatment of inflammation of the lungs must evidently be of the most decisive kind. We have to struggle with a disease intense in its character, and we must attempt radically to cure, and not merely to palliate it. Supposing the attack to have just commenced, the horse should be bled, not only until the pulse begins to rise, but until it afterwards begins to flutter or to stop, or the animal is evidently faint. The effect of the bleeding, and not the quantity of blood taken, should be regarded; for the inflammation being subdued, the loss of blood will soon be supplied again. This is one of the cases in which it is absolutely necessary that some one should stand by with his finger on the pulse to mark the effect that is produced. If six hours afterwards the horse continues to stand stiff, heaves as quickly and as laboriously as before, and the legs are as intensely cold, and the membrane of the nose as red, the bleeding should be repeated until the same effect again follows. In the majority of cases, the inflammation will now be subdued. A third bleeding, however, may sometimes be necessary, but must not be carried to the same extent, for it is possible, by too great evacuation of blood, to subdue not merely the disease but the powers of nature. If after this the legs become cold, and the heaving returns, and the membrane of the nose reddens, and the horse persists in standing, bleeding, to the extent of two or three quarts, will be advisable, to prevent the re-establishment of the disease. In all these bleedings let not the necessity of a broad-shouldered fleam or lancet, and a full stream of blood, be forgotten.

When the bleeding has evidently taken effect, we would blister the whole of the brisket, and the sides as high up as the elbows. *Blisters* are far preferable to *rowels*. They act on a more extended surface, they produce a great deal more inflammation, and are speedier in their action.

Next comes the aid of medicine. No purgative should be given: we must administer clysters, back rake, or perhaps give eight ounces of Epsom salts, dissolved in warm gruel. Having relaxed the bowels, we turn to cooling or sedative medicines, nitre, digitalis, and emetic tartar, in doses of three drachms of nitre, one of digitalis, and two of emetic tartar, repeated twice or three times in the day, and persisted in until an intermittent state

of the pulse be produced. Let the horse be warmly clothed, and placed in a cool situation. Now and then the whole skin may be rubbed with the brush; but it is indispensable that the legs should be frequently and well rubbed to restore the circulation in them, and they should be covered with thick flannel bandages. As to food, we do not want him to take any at first; a very small quantity of hay may be given to amuse him, or a *cold* mash, or green meat, but not a particle of grain. In eight and forty hours the fate of the patient will generally be decided.

Pleurisy.—Hitherto we have spoken of inflammation of the substance of the lungs; but inflammation may attack the membrane covering them and lining the inside of the chest, and be principally or entirely confined to that membrane. This is termed pleurisy. The causes or symptoms are nearly the same as before. The guiding direction will be the pulse. We have not the oppressed, but rather the hard, full one; the extremities are cold, but not so cold; the membrane of the nose is but little reddened.

The same treatment as in the other case is to be *resorted to* here. The only difference is, that aperients may be administered with more safety.

Catarrh or Common Cold.—A little warmth, a few mashes, and some doses of the medicine recommended under inflammation of the lungs, will speedily effect a cure.

Bronchitis.—This is a catarrh extending to the entrance of the lungs. It is to be treated by bleeding far less copious than in inflammation of the lungs, or even catarrh. The chest should be blistered and digitalis given, and the other treatment similar to that for inflamed lungs, with the exception of bleeding.

Catarrhal Fever.—This malady has various names, as *epidedemic catarrh, influenza, distemper.* It usually commences like inflammation of the lungs and fever, with a shivering fit, to which rapidly succeeds a hot mouth, greater heat of the skin than is natural, heaving of the flanks, and cough. The eyes are red and heavy, and the membrane of the nose red, but considerably paler than that of inflammation of the lungs, and even occasionally bordering on a livid hue. From the very commencement of the disease, there is some discharge from the nose; at first of a mere watery nature, but soon thickening and containing flakes, some of which stick to the membrane of the nose, and have been mistaken for ulcers. This discharge at no great distance of time becomes mattery and offensive. The glands likewise of the throat and under-jaw become enlarged, and the membranes of the nostrils and the throat are inflamed and tender, and therefore the food is "quidded," and there is difficulty even in swallowing water, particularly if it be cold. The horse sips and slavers in the pail,

and repeatedly coughs as he drinks. To these symptoms rapidly succeeds great weakness. The horse staggers, and sometimes almost falls; the legs swell, and enlargements appear on the chest and belly.

The treatment of catarrhal fever requires much judgment. It is clearly febrile in its commencement, but it speedily assumes the character of weakness. We will suppose the disease is discovered at its commencement. Bleeding will then be indispensable, regulated in quantity by the degree of fever, rarely exceeding four quarts, never intentionally pursued until the animal is faint, and immediately stopped when there is the slightest appearance of faintness. The bleeding should be repeated if the pulse is frequent and strong; or if the membrane of the nose is getting red, and the legs cold, and even although weakness should be rapidly coming on; but it should be in small quantity, and the effect of it carefully watched.

If the disease has been suffered to run two or three days, and the horse begins to stagger, the owner will consider well the symptoms before he ventures to bleed. Redness of the nostril, heat of the mouth, quickness and force of the pulse, will require the loss of blood, notwithstanding considerable weakness; but if the animal is quite off his feed, and the inside of the nose is livid, and he is fast losing condition as well as strength, bleeding will be better avoided.

It is of importance that the bowels should be evacuated, and the sedative medicines administered. These at first should be the same as in inflammation of the lungs, and in the same quantity; but as soon as the fever begins to remit, two drachms of the spirit of nitrous ether should be added to each dose.

Warm clothing is necessary, and particularly about the head; and although the place should still be airy, it should not be so cool as in inflammation of the lungs. If the throat should be so sore that the animal will not eat, either the parotid or the submaxillary glands, or both, should be blistered.

A great deal of weakness soon follows an attack of catarrhal fever, and it will then be necessary, even while we are subduing the fever, to support the strength of the animal. He should be offered bran mashes, damped hay, green meat, or carrots. If he refuses to take them, they should be insinuated between his grinders. If he obstinately refuses to feed, he must then be drenched with thick gruel.

The terminations of this disease most to be dreaded are, inflammation of the lungs and putrid fever.

The disease with which catarrhal fever is most likely to be confounded, is inflammation of the lungs; and as the treatment of the two is in some cases so different, the farmer should be

enabled readily to distinguish between them. If a little care be used, this will not be difficult. The febrile character of the pulse, the early discharge from the nose, the want of intense redness in the lining of the nose, the frequent painful cough, the enlargement of the glands and soreness of the throat, will sufficiently distinguish catarrhal fever from inflammation of the lungs.

The malignant Epidemic.—This commences with nearly the same symptoms as catarrhal fever. It probably at the beginning is catarrhal fever, but more than usually violent, and sooner exhausting the powers of the frame.

Its symptoms are, rapid loss of strength, stinking breath, fœtid discharge from the nostrils, all the evacuations becoming highly offensive, the pulse rapid, small, and weak, and the animal obstinately refusing to eat. It soon runs its course. Gangrene soon succeeds to inflammation, and rapidly spreads from the part first inflamed, through the whole of the cellular substance, and covers every portion of the frame.

The treatment of it is very unsatisfactory. The prevention may be a little more in our favour, by endeavoring to get rid of the previous disease by one bleeding, when in some seasons, catarrhal fever appears in a form more than usually violent; and by bleeding with extreme caution, or not bleeding at all, when debility begins to appear. A mild purgative may be first administered to carry off a part of the offensive matter contained in the bowels, after which chalk and vinegar, and opium, and gentian, and columbo, with port wine, may be plentifully given with green meat or thick gruel. But except the horse is valuable, the chance of saving him is so slight, and probably the danger of spreading the pest so great, that prudence will prompt his destruction.

Chronic Cough.—This is the necessary attendant of thick wind and broken wind, though it often arises from other causes. Notwithstanding the clearness of its cause, the cure is not so evident. Feeding has much influence in this complaint; too much dry meat, and especially chaff, increases it. It is aggravated when the horse is suffered to eat his litter, and is often relieved when Spring tares or clover are given. Carrots afford decided relief.

Thick Wind.—This consists in short, frequent, and laborious breathings, and especially when the animal is in exercise; the inspirations and exspirations often succeeding each other so rapidly as ardently to express distress, and occasionally almost to threaten suffocation.

The principal cause of thick wind is previous inflammation, and particularly inflammation of the bronchial passages. It is often the forerunner of broken wind.

Of the treatment of thick wind we have little to say. Atten-

tion to the diet and the prevention of the overloading of the stomach, and the avoidance of exercise soon after a meal, may in some degree palliate the disease, and so may constant exercise carried to the extent of the horse's power, without distressing him.

Broken Wind.—This is easily distinguished from thick wind. In thick wind, the breathing is rapid and laborious, but the inspiration and exspiration are equally so, and occupy precisely the same time. In broken wind the inspiration is performed by one effort; the exspiration by two, which is plainly to be distinguished by observing the flanks, and which occupies double the time.

Broken wind may occur without much previous disease. Gross feeding with smart exercise afterwards, or over-working, may bring it on. Yet this disease depends as much upon the cramped state of the lungs, from the pressure of an over-gorged stomach in the animal, as on the effects of over-exertion.

Medical aid is of no avail, and no one has ever witnessed the cure of a broken winded horse; yet much may be done in the way of palliation. The food of the animal should consist of much nutriment condensed in a small compass; the quantity of oats should be increased, and that of hay proportionably diminished; the bowels should be gently relaxed by the frequent use of mashes, the water should be given sparingly through the day, although at night the thirst of the animal should be fully satisfied; and exercise should never be taken when the stomach is full.

Diseases of the Stomach and Intestines.—In the Spring and early part of the Summer, horses are much troubled by a grub or caterpillar which crawls out of the anus, fastens itself upon the tail, and seems to cause a great deal of itching or uneasiness. People are sometimes alarmed at the appearance of these insects. They are the progeny of a species of gad-fly, which in the latter part of the Summer deposits its eggs on the knees and sides of the animal; they are there hatched, and the horse by its licking takes them on his tongue, they mingle with the food, and are then conveyed into the stomach. Here they remain during the Winter, and having attained some size, in the Spring pass out with the dung. These are called bots; they cannot be removed by medicine, and as they are of no injury to the horse, a wise man will leave them to themselves, or content himself with picking them off when they collect under the tail and annoy the animal.

Spasmodic Colic.—In the horse, the ilem is the usual seat of this disease. It is of much importance to distinguish between spasmodic colic and inflammation of the bowels, for the symp-

toms have considerable resemblance, although the mode of treatment should be very different.

The attack of colic is usually very sudden. There is often not the slightest warning. The horse begins to shift his po sture, look round at his flanks, paw violently, strike his belly with his feet, lay down, roll, and that frequently on his back. In a few minutes the pain seems to cease, the horse shakes himself and begins to feed; but on a sudden the spasm returns more violently, every indication of pain is increased, he heaves at the flanks, breaks out into a profuse perspiration, and throws himself more violently about. In the space of an hour or two, either the spasms begin to relax, and the remissions are of longer duration; or the torture is augmented at every paroxysm, the intervals of ease are fewer and less marked, and inflammation and death supervenes.

Among the causes of colic are, the drinking of cold water when the horse is heated. There is not a surer cause of violent spasm than this. It will sometimes follow the exposure of a horse to the cold air, or a cold wind, after violent exercise.

Turpentine is one of the most powerful remedies, especially if given in union with opium. Three ounces of spirit or oil of turpentine, with an ounce of laudanum, given in a pint of warm ale, will frequently have an almost instantaneous effect. If the relief be not obtained in half an hour, it will be prudent to bleed, because the continuance of violent spasm will produce inflammation. Some practitioners bleed at first, and it is far from bad practice, for although the majority of cases will yield to turpentine, opium, and aloes, an early bleeding may occasionally prevent the occurrence of inflammation, or at least mitigate it. If it be clearly a case of colic, half of the first dose may be repeated, with a full ounce of Barbadoes aloes dissolved in warm water. The belly should be well rubbed with a brush or warm cloth, and the horse walked about or trotted.

When relief is obtained, the clothing of the horse, saturated with perspiration, should be removed, and fresh dry clothing substituted; he should be well littered down in a warm stable, and have bran mashes for the two or three next days, and drink only lukewarm water.

Inflammation of the Bowels.—There are two varieties of this malady. The first is inflammation of the internal coats of the intestines, accompanied by considerable fever and costiveness. The second is that of the internal mucous coat, usually the consequence of an over dose of physic, and accompanied by violent purging.

The first of these is a very frequent and fatal disease. It speedily runs its course, and it is of great consequence that its early symptoms should be known. If the horse has been care-

fully observed, restlessness and fever will be seen to have preceded the attack; in some cases a direct shivering fit will be observed, the mouth will be hot, and the nose red. The horse will soon express the most dreadful pain by pawing, kicking at its belly, looking wildly at his flanks, groaning and rolling. The pulse will be quickened and small; the ears and legs cold; the belly tender and sometimes hot; the breathing quickened; the bowels costive; and the horse becoming rapidly and fearfully weak.

It may be useful to give a short table of the distinguishing symptoms of colic and inflammation of the bowels, because the treatment recommended for the former would be often fatal in the latter.

Colic.	Inflammation of the Bowels.
Sudden in its attack.	*Gradual in its approach, with previous indications of fever.*
Pulse rarely much quickened but somewhat fuller.	*Pulse very much quickened but small.*
Legs and ears of the natural temperature.	*Legs and ears cold.*
Relief obtained from rubbing the belly.	*Belly exceedingly painful and tender to the touch.*
Relief obtained from motion.	*Motion evidently increasing the pain.*
Intervals of rest.	*Constant pain.*
Strength scarcely affected.	*Rapid and great weakness.*

The causes of this disease are first of all and most frequently, sudden exposure to cold. An over-fed horse subjected to severe and continued exertion, if his lungs were previously weak, will probably be attacked by inflammation of them; but if the lungs were sound, the bowels on the following day will be the seat of disease.

The treatment of inflammation of the bowels, like that of the lungs, should be prompt and energetic. The first and most powerful means of cure will be bleeding. From six to eight or ten quarts of blood should be taken as soon as possible, and the bleeding repeated to the extent of four or five quarts more if the pain be not relieved, and the pulse have not become rounder and fuller. The speedy weakness that accompanies this disease should not deter from bleeding largely. It is the weakness that is the consequence of the violent inflammation in those parts, and if that inflammation be subdued by the loss of blood, the weakness will disappear. The bleeding should be effected on the first appearance of the disease, for there is no malady that so quickly runs its course.

Next to bleeding will follow clysters. The clyster may consist of warm water or very thin gruel, in which half a pound of Epsom salts, or half an ounce of aloes has been dissolved, and too much fluid can scarce be thrown up. If the common ox bladder and pipe be used, it should be frequently replenished. The horse may likewise be encouraged to drink plentifully of warm water or thin gruel; and draughts each containing a couple of drachms of dissolved aloes may be given every six hours, until the bowels are freely opened.

Next it will be prudent to excite considerable external inflammation as near as possible to the seat of internal disease; and therefore the whole of the belly should be blistered. The legs should be well bandaged to restore the circulation to them, and the horse should be warmly clothed, but the air of the stable kept cool.

No grain or hay should be given during the disease, but bran mashes, and green meat if it can be procured. When the horse begins to recover he may get a handful of grain two or three times a day, or he may be turned out for a few hours in the middle of the day.

The second variety of inflammation of the bowels affects the internal or mucous coat, and is generally the consequence of physic given in too great quantities, or of an improper kind. The purging is more violent, and continues longer than was intended, The animal shews that he is suffering great pain; he looks round at his flanks, his breathing is laborious, and the pulse is quick and small; not so small, however, as in the former case; the mouth is hot, and the legs and ears are warm. Unless the purging is excessive, and the pain and distress great, we would hesitate at administering any astringent medicine at first. We would plentifully administer him gruel, or thin starch, or arrowroot, by the mouth, and by clyster, removing all hay and grain. and particularly green meat. If twelve hours should pass and the purging and pain remain undiminished, we should continue the gruel, but add to it chalk, catechu, and opium, in doses of an ounce of the first, a quarter of an ounce of the second, and two scruples of the last, repeated every six hours. As soon as the purging begins to subside, the astringent medicine should be lessened in quantity, and gradually discontinued. Bleeding will rarely be necessary unless the inflammation be very great, and attended by symptoms of general fever. The horse should be warmly clothed, placed in a warm stable, and his legs hand-rubbed and bandaged.

Worms.—Worms of different kinds inhabit the intestines, but except when they exist in very great numbers, they are not so

hurtful as is generally supposed, although some may trace to them a variety of complaints.

Calomel is frequently given as a vermifuge; but the less seldom this drug is administered the better, for we believe it to be wholly inert as a vermifuge. When the horse can be spared, a strong dose of physic, so far as the long white worm is concerned, is good. But perhaps a better medicine, and not interfering with either the feeding or working of the horse, is two drachms of emetic tartar, with a scruple of ginger, made into a ball, with linseed meal and treacle, and given every morning half an hour before the horse is fed. For the small dark coloured worm, one injection of a quart of linseed oil, or an ounce of aloes dissolved in warm water, will be a more effectual remedy.

Jaundice—commonly called the yellows, is the introduction of bile into the general circulation. The yellowness of the eyes and mouth, and of the skin where it is not covered with hair, mark it sufficiently plain. The dung is small and hard, the urine high coloured, the horse languid, and the appetite impaired. If this be not the consequence of some other disease, we must endeavour to restore the natural passage of the bile by purgatives, not consisting of large doses, lest there should be some undetected inflammation of the lungs or bowels, in either of which a strong purgative would be dangerous, but given in small quantities, repeated at intervals, and until the bowels are freely opened. Two drachms of aloes and one of calomel, given twice every day, will be as much as can at all times be administered with safety. Bleeding should always be resorted to regularly, according to the apparent degree of inflammation, and the occasional stupor of the animal. Plenty of slightly-warmed water or thin gruel should be given, the horse warmly clothed, and the stable well ventilated but not cold. Carrots or green meat will be very beneficial.

Inflammation of the Kidneys.—This is no uncommon disease in the horse, and is more unskillfully and fatally treated than than almost any other. The early symptoms are those of fever generally, but the seat of the disease soon becomes evident. The horse looks anxiously round at his flanks; stands with his hinder legs wide apart; straddles as he walks, expressing pain in turning; shrinks when the loins are pressed, and some degree of heat felt there. The urine is voided in small quantities, and frequently it is high-coloured and sometimes bloody. The attempt to urinate becomes more frequent and the quantity voided smaller, until the animal strains painfully or violently, and the discharge is nearly or quite suppressed. The pulse is quick and hard, full in the early stage of the disease, but rapidly becoming small, yet

not losing its character of hardness. These symptoms clearly indicate an affection of the urinary organs; but they do not distinguish inflammation of the kidney from that of the bladder. The hand must be introduced into the rectum. If the bladder be felt full and hard close to the rectum, there is inflammation of the neck of the bladder; if the bladder be empty, yet on the portion of the intestines immediately over it there is more than natural heat and tenderness, there is inflammation of the bladder; but *if* the bladder be empty, and there is no increased heat or tenderness, there is inflammation of the kidneys.

Among the causes are improper food: mow-burnt hay or musty oats will produce it. If a horse is sprained in the loins, by being urged on far or fast, by a heavy rider, or by being suddenly pulled up on his haunches, the inflammation of the muscles of the loins is often speedily transferred to the kidneys, with which they lie in contact. Exposure to cold is also often a cause of inflammation of the kidneys.

In treating it, bleeding must be promptly resorted to, and carried to its full extent. An active purge should next be *administered*, and a counter inflammation excited, as near as *possible to* the seat of the disease. For this purpose the loins should be fomented with hot water, or covered with a mustard poultice; but no cantharides or turpentine must be used, and most of all, must no diuretic be given internally. When the action of the purgative begins to cease, white helibore may be administered, in doses of a scruple three times a day, with or without emetic tartar. The horse should be warmly clothed, his legs well bandaged, and plenty of water offered him. The food should be carefully examined, and any thing that would have excited, or may prolong the irritation, carefully removed.

Inflammation of the Bladder.—There are two varieties of this disease, inflammation of the body of the bladder, and of its neck. The symptoms are nearly the same with those of inflammation of the kidney, except that there is rarely a total suppression of the urine, and there is heat felt in the rectum over the situation of the bladder. The treatment of the first of these will be the same as in inflammation of the kidney.

In inflammation of the neck of the bladder, the spasm of the part must be relaxed. The most likely means to effect this is to bleed largely, and even to fainting. This will sometimes succeed, and there will be an end at once of the disease. To the exhaustion and loss of muscular power occasioned by copious bleeding, should be added the nausea subsequent on physic. Should not this speedily have effect, another mode of abating the spasm must be tried. A drachm of the powdered opium, made

into a ball or drink, may be given every two or three hours, while an active blister is applied externally.

Stone in the Bladder.—The symptoms of stone in the bladder much resemble those of spasmodic colic, except that on careful inquiry it will be found that there has been much irregularity in the discharge of urine, and occasional suppression of it. Diuretics mixed with a small portion of cordial medicine, will be beneficial, although in some extreme cases slight scarifications may be necessary.

CHAPTER IV.

DISEASES ARISING FROM INJURY, &c.

Sprain in the Shoulder.—The symptoms of shoulder lameness can scarcely be mistaken. In sprain of the shoulder the horse will evidently suffer extreme pain while moving, and the muscle underneath being inflamed and tender, he will extend it as little as possible. *He will drag his toe along the ground.* It is in the lifting of the foot that the shoulder is principally moved: if the foot be lifted high, let the horse be ever so lame, the shoulder is little if at all affected. The lame limb is suffered to bear the weight a much shorter time in this than in any other lameness. In sprain of the back sinews, it is only when the horse is in motion, that the injured parts are put to most pain; the pain is greater here when the weight rests on the limb, and, therefore, there is a peculiar quickness in catching up the limb, in shoulder lameness, the moment the weight is thrown on it. This is particularly evident when the horse is going down hill, and the injured limb bears an additional portion of the weight.

In sprain of the internal muscles of the shoulder, few local measures can be adopted. The horse should be bled from the vein on the inside of his arm (the plate vein), because the blood is then abstracted more immediately from the inflamed part. A dose of physic should be given and fomentations applied, and principally on the inside of the arm, close to the chest, while the horse is kept as quiet as possible.

Broken Knees.—The treatment of broken knees is a subject of considerable importance, for many horses are sadly blemished, and others are destroyed, by wounds in the knee joint. The horse when falling, naturally throws his knees forward, they receive all his weight, and are sometimes extensively lacerated. The first thing to be done is, by very careful washing with warm water, to cleanse the wound from all gravel and dirt. It must then be ascertained whether the joint is penetrated. The grating of the probe on one side of the knee, or the depth to which the probe enters the wound, will often too plainly indicate that the joint has been opened. Should any doubts exist, let a linseed meal poultice be applied. This will at least act as a fomentation

to the wound, and will prevent or abate inflammation; and when twelve hours afterwards it is taken off, the *synovia* or *joint oil*, in the form of a glairy, yellowish, transparent fluid, will be seen, if the capsular ligament has been penetrated. Should doubt remain after the first poultice, apply a second.

The opening of the joint being ascertained, the first and immediate care is to close the orifice; for the fluid which separated and lubricated the bones of the knee being suffered to flow out, they will be brought into actual contact with each other, they will rub upon each other, the delicate membrane with which they are covered will be highly inflamed, the constitution will be speedily affected, and a degree of fever will ensue that will destroy the horse; and in the mean time of all the tortures that can be inflicted on the poor animal, none can equal that which accompanies inflammation of the membranes lining the joints.

The manner of closing the orifice should properly be left to the veterinary surgeon. It may be effected by a compress, inclosing the whole of the wound, and not to be removed for many days; or it may be attempted by the old and generally successful method of applying the hot iron over the wound, and particularly over the spot where the ligaments appear to be lacerated. A poultice may be placed on the part, and the case treated as a common wound. Should the joint oil continue to flow, the iron may be applied a second or even a third time. By the application of the iron, so much swelling is produced on the immediate puncture, and in the neighbouring parts, as mechanically to close and plug up the orifice.

If, however, the opening into the joint be extensive, and the joint oil continues to flow, and the horse is evidently suffering much pain, humanity would dictate that he should be destroyed. The case is hopeless. A slight degree of fever will ere long carry off the animal, or the inflammation will cause a deposit of matter in the cavity of the joint, which will produce incurable lameness.

Splint.—The splint is invariably found on the outside of the small bone, and generally on the inside of the leg, though these humours occasionally appear on other parts of the shank bone, being the consequence of violent blows, or other external injuries. When the splint is forming the horse is frequently lame, but this soon disappears. Splints then do not necessarily cause unsoundness, and may not lessen in the slightest degree the value or action of the horse. All depends on the situation.

The treatment of splints, if it be worth while to meddle with them, is exceedingly simple. The hair should be closely shaved round the tumour; a little strong mercurial ointment rubbed in for two days, and this should be followed by an active blister.

If the splint be of recent formation, it will usually yield to this, or to a second blister. Should it resist these applications, it can rarely be advisable to cauterize the part, unless the tumour interferes materially with the action of the suspensary ligament; for it not unfrequently happens that, although the splint may have resisted this treatment, it will afterwards, and at no great distance of time, begin rapidly to lessen and quite disappear. There is also a natural process by which the greater part of splints disappear when the horse gets old.

Sprain of the Back Sinews.—A slight injury of these parts is called a sprain of the back sinews or tendons; and when it is more serious, the horse is said to have *broken down.*

In every serious affection of this kind, care should be taken that the local inflammation does not produce general disturbance of the system; and therefore the horse should be bled and physicked. The bleeding may be at the toe, by which an important local as well as general effect will be produced. The vessels of the part will be relieved, while fever will be prevented. Let not the bleeding be performed in the usual farrier's way of first paring down the sole, and then taking out a piece of it at the toe of the frog, in which case a wound is made often difficult to heal; but after the sole has been well trimmed, let a groove be cut, with the rounded head of a small drawing knife, at the junction of the sole and the crust. The large vein at the toe will then be opened, or the groove may be widened backward until it be found. When the blood begins to appear, the vein may be more freely opened, or a lancet thrust horizontally under the sole, and almost any quantity of blood may be easily procured. The immersion of the foot in warm water, will cause the blood to flow more rapidly. When a sufficient quantity has been drawn, a bit of tow may be placed in the groove, and the shoe tacked on. The bleeding will immediately be stopped, and the wound will readily heal.

As a local application, let the leg be well fomented with warm water two or three times a day, aud half an hour at each time; and between the fomentations let the leg be inclosed in a poultice of linseed meal. Any herb that pleases the owner may be added to the fomentation, or vinegar to the poultice: but the beneficial effect of both depends on the warmth of the water, and the moisture of the poultice. The first object is to abate inflammation.

The horse beginning to put his foot better to the ground, and to bear pressure on the foot, and the heat having disappeared, the object to be accomplished is changed; recurrence of the inflammation must be prevented, the enlargement must be got rid of, and the parts must be strengthened. The two latter purposes

cannot be better effected than by using an elastic bandage—one of flannel will be the best. Let this be kept wet with vinegar, to each pint of which a quarter of a pint of spirits of wine has been added, and tightened daily in proportion as the parts are capable of bearing increased pressure, and the treatment should be persisted in for a fortnight; if at the expiration of that period there be no swelling, tenderness, or heat, the horse may gradually and very cautiously be put to his usual work.

Should there, however, remain the slightest lameness or considerable enlargement, the leg must be blistered, and then time must be given it to produce its gradual and full effect; and the horse should be turned out for one or two months; and here we must repeat, that a blister should never be used while any heat or tenderness remains about the part, otherwise the slightest injury may be, and often is, converted into incurable lameness.

Wind Galls.—Approaching near to the fetlock, we occasionally find considerable enlargements, oftener on the hind leg than the fore one, which are denominated wind galls. There are few horses perfectly free from them. When they first appear, and until the inflammation subsides, they may be accompanied by some degree of lameness; but otherwise, except when they attain an enormous size, they do not interfere with the action of the animal, or cause unsoundness.

A slight wind gall will scarcely be the subject of treatment; but if these tumours are numerous and large, and seem to impede the motion of the limb, they may be attacked first by bandage, wetted with the lotion recommended for sprain of the back sinews. Blistering, however, is more effectual, and firing still more certain, if the tumours be sufficiently large and annoying to justify so severe a measure.

Sprain of the Coffin Joint—(where the coffin bone or bone of the foot is joined to the small pastern bone, and which forms the coffin joint).—The proof of this is when the lameness is sudden, and the heat and tenderness is principally felt round the coronet (top of the hoof.) Bleeding the toe, physick, fomentation and blisters, are the usual remedies adopted. Sprain of the coffin joint sometimes becomes a very serious affair, not being always attended with any external swelling, and being detected only by heat round the coronet, the seat of the stomach is often overlooked, and the disease is suffered to become confirmed before its nature is discovered.

Ring Bone.—This is produced by violent and frequent sprains of the pastern or coffin joints. It commences in one of the pasterns, and usually about the pastern-joint, but it rapidly spreads, and involves not only the pastern bones, but the cartilages of the foot.

It first makes its appearance in a slight enlargement, or bony tumour on each side of the foot, and just above the coronet. This is more frequently the hind foot than the fore. In its early stage, and when recognized only as a bony enlargement, the lameness is not very considerable, and it is not impossible to remove the disease by an active blistering, or by the application of the cautery. But this disease has a strong disposition to spread, (and at first around the pastern joint, which is situated just above the coronet, and from this it has its name), until the whole of this part of the foot becomes one mass of spongy bone.

Ringbone is one of the most serious lamenesses, with which the horse can be afflicted. It is unsoundness when existing in the slightest degree; for the lateral excitement may speedily extend, and when the bony deposit begins to spread, the disease is incurable.

Thorough pin.—There are placed in the neighbourhood of joints certain bags, containing a mucous fluid for the purpose of lubricating the parts, and these sometimes become inflamed and enlarge. We have spoken of *wind galls* and their treatment. A similar enlargement is found above the hock between the tendons of the flexor of the foot and the extensor of the hock. As from its situation it must necessarily project on both sides of the hock in the form of a round swelling, it is called a *thorough pin*. It is an indication of considerable work, but unless it be of very great size, is rarely attended by lameness. The mode of treatment must resemble that recommended for wind galls.

Enlargement of the Hock.—The hock, from its complicated structure and its work, is the principal seat of lameness behind. Nine-tenths of the lamenesses that occur in the hind leg are to be traced to this joint, and when, after careful examination, we are unable to find any other seat of the lameness, we shall usually be justified in asserting that the hock is affected.

In enlargement of the hock, there is first inflammation or sprain of the hock generally, arising principally from sudden violent concussion, from check of speed, or from our weight, and attended with enlargement of the whole joint, and great tenderness and lameness. This, however, like other diffused inflammations, is not so untractable as intense inflammations of a more circumscribed nature; and by rest and fomentation, and perhaps firing, the limb recovers its action, and the horse becomes fit for ordinary work. The swelling, however, does not always subside. Enlargement, spread over the whole of the hock joint, remains. A horse with enlarged hock, must always be regarded with suspicion, and is in truth unsound. The horse may discharge his usual work without returns of the lameness, but if one of those emergencies should occur, when all his energies require to be

exerted, the disorganized or weakened foot will in all probability fail.

Curb.—This is an enlargement of the back of the hock about three or four inches below the point of the hock. Any sudden action of the limb, or more than usual violence, straining the part, may produce it. Young horses are particularly liable to it.

Curbs are generally attended by considerable lameness at their first appearance, but the swelling is not always great; indeed, it sometimes presents so gradual a curve, that it is scarcely perceivable when we stand behind the horse. It is best detected by observing the leg sideways.

The first object in attempting the cure is to abate inflammation, and this will be more readily accomplished by cold evaporating lotions frequently applied to the part. Equal portions of spirits of wine, water, and vinegar, will afford an excellent application. It will be almost impossible to keep a bandage on. If the heat and lameness are considerable, it will be prudent to physic the horse, and to bleed from the subcutaneous vein. But more active means will be necessary to perfect the cure. Either a liquid blister should be rubbed on the part, consisting of a vinous or turpentine tincture of cantharides, and this daily applied until some considerable swelling takes place, which should be allowed to subside, and the linament again resorted to; or, what is the preferable plan, the hair should be cut off, and the part blistered as soon as the heat has been subdued. The blister should be repeated until the horse goes sound, and the swelling has disappeared. In some cases it may be necessary to fire, but we cannot recommend the indiscriminate use of the hot iron in every case of curb, and we would uniformly give a fair trial to milder measures. If the iron be used, the strokes should be in straight lines.

No horse that has had curbs should be put even to ordinary work, in less than a month after the apparent cure, and even then he should very gradually resume his former habits.

A horse with a curb is manifestly unsound; even the vestige of it should create suspicion.

Bog or Blood Spavin.—This is a tumour on the inside of the hock filled with blood, and is a very serious disease, attended with no great but often permanent lameness, and a disease too apt to return, when the enlargement has subsided under medical treatment. It must be considered as decided unsoundness. In a horse for slow draught, it is scarcely worth while even to attack it. In a horse destined to more rapid action, the probability of a relapse should not be forgotten, when the chances of success and the expense of treatment are calculated.

The disease (the enlarged mucous capsule) lies deep, and is

with difficulty operated upon. Uniform pressure will sometimes cause the absorption of the fluid, but it is difficult to confine the pressure to the proper place. Repeated blisters will afford the fairest prospect of removing the tumour; firing may be tried; but in the majority of cases the disease will bid defiance to all our means, and will return and baffle our hopes when we had seemed to have been accomplishing our object. A horse with bog spavin will do very well for ordinary work, but he will never do for rapid or hard work.

Bone Spavin.—A still more formidable disease ranks under the name of spavin, and is an affection of the bones of the hock joint. This is uniformly on the inside of the hind leg; and it appears generally in the form of a tumour, where the head of the splint bone is united with the shank, and in front of that union. This is called *bone spavin*.

When the spavin is forming there is always lameness, and that frequently to a very great degree, but this afterwards subsides. There is also this peculiarity, that this lameness abates and sometimes disappears on exercise; and therefore a horse with regard to which there is any suspicion of spavin, should be examined when at first in the morning he is taken from the stable.

Spavined horses are generally capable of slow work, they are equal to the greater part of the work of the farm, and therefore they should not be always rejected.

The treatment of spavin is simple enough, but not always effectual. The owner of the horse will neither consult his own interest, nor the dictates of humanity, if he suffers the chisel and mallet, or the gimblet, or the pointed iron, or arsenic, to be used; yet measures of considerable severity must be resorted to. Repeated blisters will usually cause either the absorption of the bony deposit, or the abatement or removal of the inflammation of the ligaments. As a last resort, however, the hot iron may be applied.

Capped Hock.—The point of the hock is sometimes swelled. A fluctuating tumour appears on it. This is an enlargement of one of those mucous bags of which we have spoken, and which surrounds the insertion of the tendons into the point of the hock. It is seldom accompanied by lameness, but yet it is a serious business. It is usually produced by blows, and, in the majority of instances, by the injury which the horse inflicts upon himself by kicking; therefore a horse with a capped hock is properly regarded with a very jealous eye. The whole of the hock should be most carefully examined in order to discover whether there are other marks of violence, and the previous history of the animal should if possible be obtained.

Here again it is exceedingly difficult to apply the bandage;

and puncturing the tumor or passing a seton through it, would be a most injurious and dangerous practice. Blisters repeated as long as may be necessary, are the proper means to be employed. Sometimes the tumour will disappear of itself, but at others it will attain a very large size, or will assume a callous structure, that will bid defiance to all the means we can employ.

Mallenders and Sallenders.—In the inside of the hock or a little below it, as well as at the bend of the knee, there is sometimes a scurfy irruption called *mallenders* in the fore leg, and *sallenders* in the hind leg. They seldom produce lameness, but if no means are taken to get rid of them, a discharge proceeds from them which it is afterwards difficult to stop; and certainly they have an unsightly appearance, and generally argue bad stable management. A diuretic ball should be occasionally given, and an ointment composed of one part of sugar of lead, two of tar, and fourteen of lard, rubbed over the foot. Should this fail, the weak mercurial ointment should be used.

Spring Halt—Is a peculiar involuntary twitching of the hind leg, or convulsive action of the muscles, by which it is bent. This is evidently an affection of the nerves, and no cure for it has been discovered.

Swelled Legs.—The fore legs are sometimes subject to considerable enlargement, but much oftener the hind ones. This is occasioned in various ways. Fomentation, diuretics, or physic, or, if there be much fever, a moderate bleeding, will often relieve the distortion, almost as sudden as it appeared.

Grease.—Swelled legs, although distinct from grease, are apt to degenerate into it. It is an inflammation of the skin of the heel, sometimes of the fore, but oftener of the hind foot. It is not a contagious disease, although when it once appears in a stable it frequently goes through it, for it is usually to be traced to bad stable management. The farmer's horse is not so subject to grease as many others.

Grease is a local complaint; it is produced principally by causes which act locally, and it is most successfully treated by local applications. Physic and diuretics may be useful in abating inflammation, but the grand object is to abate the imflammatory action which exists in the skin of the heel, and to heal the wounds and remedy the mischief which it has occasioned.

The first appearance of grease is usually a dry and scurfy state of the skin of the heel, with redness, heat, and itchiness. The heel should be well washed with soap and water, as much of the scurf should be detached as is easily removeable, while ointment composed of one drachm of sugar of lead, rubbed down with an ounce of lard, will usually supple, and cool, and heal the part.

When cracks appear, the mode of treatment will depend on their extent and depth. If they are but slight, a lotion composed of a solution of two drachms of blue vitriol or four of alum, in a pint of water, will often speedily dry them up and close them. But if the cracks are deep with an ichorous discharge, and the lameness considerable, it will be necessary to poultice the heel. A poultice of linseed meal will be the most effectual, unless the discharge is thin and offensive, when an ounce of finely powdered charcoal should be mixed with the linseed meal, or a poultice may be made of carrots boiled soft and mashed. The efficacy of a carrot poultice is seldom sufficiently appreciated in cases like these.

When the inflammation and pain have evidently subsided, and the cracks discharge good matter, they may be dressed with an ointment composed of one part of rosin and three of lard, melted together, and one part of calomine powder added, when these begin to cool. The healing will be quickened if the cracks are occasionally washed with either the vitriol or alum solution. A mild diuretic may be given every third day, but a mild dose of physic will form the best medicine that can be administered.

After the chaps or cracks have healed, the legs will sometimes continue gorged or swelled. A flannel bandage merely applied over the whole of the swelled part, will be very serviceable; or should the season admit of it, a run at grass, particularly Spring grass, should be allowed. A blister is inadmissible, from the danger of bringing back the inflammation of the skin and discharge from it; but the actual cautery, taking especial care not to penetrate the skin, must occasionally be resorted to.

In some cases the cracks are not confined to the centre of the heels, but spread over them and extend on the fetlock, and even up the leg, while the legs are exceedingly swelled, and there is a watery discharge from the cracks, and apparently oozing through the skin at other places. The parts are exceedingly tender and sometimes hot, and there is an appearance which the farrier thinks very decisive as to the state of the disease, and which the better informed man should not overlook—*the heels smoke*;—the skin is so hot, that the watery fluid partly evaporates as it runs from the cracks or oozes through the skin.

There will be great danger in suddenly stopping this discharge; inflammation of a more important part has rapidly succeeded to the injudicious attempt. The local application should be directed to the abatement of the inflammation. The poultices just referred to should be diligently used night and day, and especially the carrot poultice; and when the heat and tenderness and stiffness of motion have diminished, astringent lotions may be applied; either the alum lotion, or a strong decoction of oak bark, changed

or used alternately, but not mixed. The cracks should likewise be dressed with the ointment above mentioned ; and the moment the horse can bear it, a flannel bandage should be put on, reaching from the coronet to three or four inches above the swelling. The medicine should be confined to mild diuretics, mixed with one-third part of cordial mass, or, if the horse be gross, and the inflammation runs high, a dose of physic may be given.

The feeding will likewise vary with the case, but with these rules, which admit of no exception: that green meat should be given, and more especially carrots, when they are not too expensive, and mashes if the horse will eat them, and never the full allowance of grain.

Walking exercise should be resorted to, as soon as the horse is able to bear it, and this, by degrees, may be increased to a gentle trot.

Inflammation of the Foot, or Acute Founder.—Whatever would cause slight inflammation of other parts, or trifling general derangement, will produce all its mischief on the organs of the foot.

To an attentive observer, the symptoms of fever in the feet are clearly marked, and yet there is no disease more frequently overlooked. The earliest symptoms are fidgetiness, frequent shifting of the fore legs, but no pawing, much less any attempt to reach the belly with the hind feet. The pulse will soon be quickened, the flanks heaving, the nostrils red, and the horse, by his anxious countenance and perhaps by moaning, indicating great pain. Presently he will look about his litter as if preparing to lie down, but he does not do it immediately ; he continues to shift about ; he is afraid to draw his feet sufficiently under him for the purpose of lying down, but at length he drops.

If his feet be now examined, they will be evidently hot, the horse will express pain if they are slightly rapped with a hammer, and the artery at the pastern will throb violently. No great time will now pass, if the disease be suffered to pursue its course, before he will be perfectly unable to rise ; or, if he is forced to get up, and one foot be lifted, he will stand with difficulty on the other, or perhaps drop at once from intense pain.

The treatment will resemble that of other inflammations, with such differences as the situation of the disease may suggest. Bleeding is indispensable, and that to its fullest extent. If the disease be confined to the fore feet, four quarts of blood should be taken as soon as possible from the toe of each, in the manner already described ; poultices of linseed meal, made very soft, should cover the whole of the foot and the pastern, and be frequently renewed, which will promote evaporation from the neighboring parts, and possibly through the pores of the hoof, and b

softening and suppling the hoof, will relieve its painful pressure on the swelled and tender parts beneath. More fully to accomplish this last purpose, the shoe should be removed, the sole pared as thin as possible, and the crust and particularly the quarters well rasped. All this must be done gently with a great deal of patience, for the poor animal can scarcely bear his foot to be meddled with. There is doubt as to the propriety of administering physic. Sedative and cooling medicines should be diligently administered, consisting of digitalis, nitre and emetic tartar, in the proportions already recommended.

If no amendment be observed, three quarts of blood should be taken from each foot on the following day, and, in extreme cases, a third bleeding of two quarts may be justified, and instead of the poultice, cloths kept wet with water in which nitre has been dissolved *immediately before*, and in the proportion of an ounce of nitre to a pound of water, may be wrapped round the feet. About the third day a blister may be tried, taking in the whole of the pastern and the coronet ; but a cradle must previously be put on the neck of the horse, and the feet must be covered after the blister, or they will probably be much blemished. *The horse* should be kept on mash diet, unless green meat can be procured for him, and even that should not be given too liberally, nor should he in the slightest degree be coaxed to eat. When he appears to be recovering, his getting on his feet should not be hurried. It should be left perfectly to his own discretion ; nor should even walking exercise be permitted until he stands firm on his feet, when, if the season will permit, two months run at grass will be very serviceable.

Pumiced Feet.—The sensible and horny little plates which were elongated and partially separated during the intensity of the inflammation, will not always perfectly unite again, or will have lost much of their elasticity, and the coffin bone no longer fully supported by them, presses upon the sole, and the sole becomes flattened, or even convex, or projecting, by this unnatural weight, and the horse acquires a *pumiced foot*. For this there is no cure.

Thrush—Is a discharge of offensive matter from the cleft of the frog. It is an inflammation of the lower surface of the sensible frog, and during which pus is secreted together with instead of bone.

Thrushes are not always accompanied by lameness. In a great many cases the appearance of the foot is scarcely, or not at all altered, and the disease can only be detected by close examination, or the peculiar smell of the discharge.

There are few errors more common or more dangerous, than that the existence of thrush is a matter of little consequence, or even as some suppose a benefit to the horse,—a discharge for

superabundant humours,—and that it should not be dried up too quickly, and in some cases not dried up at all.

There are many recipes to stop a running thrush: almost every application of an astringent, but of not too caustic a nature, will have the effect. The common Ægyptiana (vinegar boiled with honey and verdigrease,) is a very good liniment; but the most effectual and the safest dryer up of the discharge speedily, but not suddenly, is a paste composed of two ounces of blue and one of white vitriol, powdered as finely as possible, and rubbed down with one pound of tar and one of lard. A pledget of tow covered with it should be introduced as deeply as possible, yet without force, into the cleft of the frog every night, and removed in the morning before the horse goes to work. It will be necessary to preserve the frog moist while the cure is in progress, and this may be done, by filling the feet with tow covered by common stopping, or using the felt pad, likewise covered with it.

Canker—Is a separation of the horn of the foot from the sensitive part of the foot, and the sprouting of fungus matter instead of it, and occupying a portion of or even the whole of the sole and frog. It is the occasional consequence of injury, but oftener of neglected thrush. The cure of it is the business of the veterinary surgeon, and a most harassing and tedious business it is.

In addition to the foregoing, there are several other diseased states of the foot to which the horse is liable, but which in those cases where remedy may be had, are rather subjects for the veterinary surgeon, than for domestic treatment.

Hide Bound.—Hide bound is not so much a diminution of the cellular substance between the skin and the muscles and bones beneath, as it is an alteration in the skin itself. It is a hardness and unyieldingness of the skin for the want of oily matter on its surface, and in its substance. It is not so much a disease as a symptom of disease, and particularly of the digestive organs; and our remedies must be applied, not so much to the skin (although we have in friction and in warmth, most valuable agents in producing a healthy condition of the integuments,) as to the *cause* of the binding of the coat, and the state of the constitution generally.

Should the cause be obscure, as it frequently is—should the horse wear an unthrifty coat, and his hide cling to his ribs without any apparent disease, we shall be warranted in tracing it to sympathy with the actual, although not demonstrable suspension of some important secretion, and generally in the alimentary canal; therefore a few mashes, and a mild dose of physic, are first indicated, and simple as they may appear to be, they often have a very beneficial effect. If the horse cannot be spared for physic, alteratives may be administered, and none better than

levigated antimony, nitre and sulphur; and given in these cases, in doses of two drachms of the first, three of the second, and four of the last, and repeated every night in a mash or in the form of a ball. Warmth of clothing and friction may also be employed to advantage.

Surfeit.—Large pimples or lumps suddenly appear on the skin of the horse, and especially in the Spring; and occasionally they disappear as quickly as they come. These lumps are in some cases confined to the neck; but they oftener spread over the sides, back, loins, and quarters. This is called a surfeit. Sometimes they are attended with itching; at other times they do not seem to annoy the animal.

Bleeding will always be beneficial. From three to five quarts may be taken according to the strength of the horse, the extent of the eruption, and the degree of fever. Physic never does good. If surfeit be connected with some unhealthy affection of the stomach or intestines, it is that which the nausea or subsequent action of the purgative increases. Alteratives will be found useful, particularly the alterative which was recommended for hide bound, and in the same doses. This disease sometime degenerates into mange.

Mange—Is a pimpled or lumpy eruption. After a while the vesicle breaks, the cuticle and the hair fall off, and there is as in obstinate surfeit, a bare spot left covered with scurf; but some fluid oozes from the skin beneath, aud this scurfiness changes to a scab which likewise soon peals off and leaves a wider spot; sometimes another scab succeeds to the first, but oftener a mere scaly, greasy-feeling, bare spot remains. This is attended with considerable itching and tenderness, and thickening of the skin, which soon becomes more or less folded or puckered. The mange generally first appears on the neck, at the root of the mane, and its existence may be pretty truly ascertained, even before the blotches appear, and when there is only considerable itchiness of the part, by the ease with which the short hair at the root of the mane is plucked out. From the neck it spreads upwards to the head or downwards to the withers and back, and occasionally extends over the whole carcase of the horse.

One cause of it is neglected or inveterate surfeit. The more common cause is contagion. No disease is more contagious than this. The same brush or curry comb used on all horses will propagate it.

The propriety of bleeding in cases of mange must depend on the condition of the patient. If it be the result of poverty and the animal is much debilitated, bleeding will be adding power to the cause of the disease. Physic, however, is indispensable. It is the first step in the progress towards cure. A mercurial ball

will be preferable to a common aloetic one, as more certain and effectual in its operation. In this, however, mange in the horse resembles the itch in the human being—that medicine alone will never effect a cure. There must be some local application. There is this further similarity, that that which is most effectual in curing itch, must form the basis of every local application as it regards the horse. Sulphur is indispensable in every unguent for mange.

In an early and very acute state of mange, one ounce of the flour of sulphur should be well rubbed down with an equal quantity of train oil, and half an ounce of common turpentine. A tolerably stout brush or even a curry comb, lightly applied, should be used, wherever there is any appearance of mange, to remove the dandriff or scurf. After that, the horse should be washed with strong soap and water as far as the disease has extended; and when he has been thoroughly dried, the ointment should be well rubbed in with the naked hand or with a piece of flannel. More good will be done by a little of the ointment being well rubbed in, than by a great deal being merely smeared over the part. The rubbing should be daily repeated. During the application of the ointment, and as soon as the physic has set, an alterative ball or powder similar to those recommended for the other affections of the skin, should be daily given. If after some days have passed no progress should appear to have been made, half a pound of sulphur may be well mixed with a pint of oil of tar, or, if that is not to be obtained, a pint of Barbadoes tar, and the affected parts rubbed as before. On every fifth or sixth day, the ointment should be washed out with warm soap and water. The progress towards cure will be ascertained; the skin will be cleaned, and its pores opened for the more effectual application of the ointment.

The horse should be well supplied with nourishing, but not stimulating, food.

Warts.—These are tumours of variable size, arising first from the skin, by means of the vessels which supply the growth of the tumours. They are formed sometimes on the eye-lids, on various parts of the skin, and on the prepuce. They must be removed by an operation.

If the root be very small, it may be snipped asunder with a pair of scissors close to the skin, and the root touched with the lunar caustic. If the febrile or stem be somewhat larger, a ligature of waxed silk may be passed firmly round it and tightened every day. If they are large it may be necessary to cut them off, and sear the root with a red hot iron.

Moulting—is the progress by which the horse twice in the year changes the hair of his body. As there is at this time a

considerable expenditure of the vital power, the health of the animal is generally affected, and he is unequal to much hard work.

Common sense would require, that in this deranged state of health excitants should be scrupulously avoided. Not only no cordials should be given, but the usual quantity of food should be diminished, bran mashes should be given—a little fever or alterative medicines may be administered, such as that which we have just described, and the horse should be a little more warmly clothed, and sudden or too great exposure to cold should be guarded against.

Operations.—These belong more to the veterinary surgeon than to the proprietor of the horse, but a short account of the manner of conducting the principal ones should not be omitted.

It is frequently necessary to bind the human patient, and in no painful or dangerous operation should this preliminary be omitted. It is more necessary to bind the horse, who is not under the control of reason, and whose struggles may not only be injurious to himself, but dangerous to the operator.

The *side line* is a very simple and useful method of confining the horse, and place him in subjection for the operations of docking, nicking, and firing. The long line of the *hobbles* on a common cart rope with a noose at the end, is fastened on the pastern of one hind leg. The rope is then brought over the neck and round the withers, and there tied to the portion that comes from the leg; the leg may thus be drawn so far forward, that while the horse cannot evidently kick with that leg, he is disarmed of the other; for he would not have sufficient support under him if he attempted to raise it. Neither can he easily raise his fore legs, or if he attempts to use them, one of them may be lifted up, when he becomes nearly powerless. If necessary, the aid of the twitch or the barnacles may be resorted to.

For every minor operation, and even for many that are of more importance, this mode of restraint is sufficient; especially if the operator has active and determined assistants, and we confess that we are no friends to the casting of horses, if it can possibly be prevented. When both legs are included in this hobble or rope (as in another way of using the side line), the horse may appear to be more secure, but there is a great danger of his falling in his violent struggles during the operation.

Among the minor methods of restraint, but sufficient for many purposes, are the *twitch* and the *barnacles*. The former consists of a noose passed through a hole at the end of a strong stick, and in which the muzzle is enclosed. The stick being turned the muzzle is securely retained, while the horse suffers great pain from the pressure, sufficiently great to render him compara-

tively inattentive to that which is produced by the operation; at the same time he is afraid to struggle, for every motion increases the agony caused by the twitch, or the assistant has power to increase it by giving an additional turn to the stick.

The barnacles are the handle of the pincers placed over and inclosing the muzzle, and which being compressed by the assistant give pain almost equal to that of the twitch. These may appear to be barbarous modes of enforcing submission, but they are absolutely indispensable. In a few instances the blindfolding of the horse terrifies him into submission, but this is not to be depended upon. The twitch should be resorted to when the least resistance is offered; and when that, as it occasionally does, renders the horse more violent, recourse must be had to the side lines or the hobbles.

In painful examination of the fore leg or foot while on the ground, the other foot should be held up by an assistant; or, if his aid be required in an operation, the knee may be fully bent and the pastern tied up to the arm. When the hind leg is to be examined in the same way, the hind leg on that side should be held or fastened up.

Bleeding.—The operation of bleeding has been already described (p. 373), but we would remind our readers of the necessity in every case of acute inflammation, of making a large orifice and abstracting the blood as rapidly as possible, for the constitution will thus be more speedily and beneficially affected; and also of the propriety of never determining to take a precise quantity of blood, but of keeping the finger on the artery until the pulse begins to change—until the strong pulse of fever becomes softer, or the animal is faint, or the oppressed pulse of inflammation of the lungs is rounder and fuller.

Blistering.—Of blisters we have spoken when treating of the various diseases to which they are applicable.

There is no better blister ointment or active blister than the Spanish fly, mixed with the proportion of lard and resin already mentioned, viz. one part of powdered Spanish flies and four of lard, and one of resin, well rubbed in. The best liquid or sweating blister is an infusion of the fly in turpentine, and that lowered with neat's foot oil, according to the degree of activity required.

In preparing the horse for blistering, the hair should be clipped or shaved as close as possible, and the ointment thoroughly rubbed in. Much fault is often found with the ointment if the blister does not rise, when the real blame should be attributed to the idleness of the operator.

If a blister be properly treated, and the horse prevented from interfering with it, either by rubbing or otherwise, it will rarely produce the slightest blemish.

34*

Firing.—Whatever seeming cruelty may attend this operation, it is in many cases indispensable. The principle on which we have recourse to it, is similar to that which justifies the use of a blister; by producing a superficial inflammation we may be enabled to remove a deeper seated one. Humanity, however, will dictate that it should only be resorted to when milder means fail.

The part which is to be submitted to the operation is shaved, or the hair is cut from it as closely as possible with the trimming scissors. This is necessary to bring the iron into immediate contact with the skin; and the operation cannot safely be performed unless the horse be thrown.

On the day after the operation, it will be prudent gently to rub some neat's foot oil or lard over the lines. Any cracks of the skin or ulcerations that may ensue, must be treated with the calomine ointment already recommended.

The firing, in every case, should be either in longitudinal or parallel lines. On the back sinews, the fetlock, and the coronet, this is peculiarly requisite, for thus only will the flesh contract and form the most equable pressure.

Setons.—These are pieces of tape or cord, passed by means of an instrument resembling a large needle through the abscesses, or the base of ulcers with deep sinews, or between the skin and the muscular or other substances beneath. They are retained there by the ends being tied together, or by a knot at each end. The tape is moved two or three times in the day, and occasionally wetted with spirits of turpentine, or some acrid liquid, in order to increase the inflammation which it produces, or the discharge intended to be established.

The case in which setons may be proper, have been already mentioned. In inflammation of extensive organs they may afford only a feeble aid. Their action is too circumscribed.

Unsoundness of Horses.—There are few sources of greater annoyance both to the buyer and seller of the horse, than disputes with regard to the soundness of the animal. That horse is sound in which there is no disease, nor any alteration of structure that does interfere, or is likely to interfere, with his natural usefulness. That horse is unsound that labours under disease, or that has some alteration of structure that does interfere, or is likely to interfere, with his natutal usefulness.

These principles will be best illustrated by a brief consideration of the usual supposed causes of unsoundness.

Broken Knees, certainly do not constitute unsoundness after the wounds are healed, unless they interfere with the action of the joint, for the horse may have fallen through mere accident, or through the fault of the rider.

Capped Hocks may be produced by lying on an unevenly paved stable with a scanty supply of litter, or by kicking, in neither of which cases would they constitute unsoundness, though in the latter they are an indication of vice.

Contraction is a considerable deviation from the natural form of the foot, but not necessarily constituting unsoundness. Careful examination must determine whether there is disease about the parts.

Corns manifestly constitute unsoundness. They are very seldom radically cured.

Cough.—This is a disease and consequently unsoundness; for however slight the disease may be, it may degenerate into dangerous complaints.

Roaring, *Wheezing*, *Whistling*, *High Blowing*, and *Grunting*, being the result of alteration of structure or disease in some of the air passages, and interfering with the perfect freedom of breathing, and especially when the horse is put on his speed, without doubt constitute unsoundness. There are decisions to the contrary, which are now universally admitted to be erroneous. *Broken Wind* is still more decidedly unsoundness.

Crib-biting.—Although there is some difference of opinion among veterinary surgeons on this point, crib-biting must be regarded as unsoundness. This unnatural sucking in of the air must be to a certain degree injurious to digestion, must dispose to colic, and interfere with the strength, and usefulness, and health of the horse.

Curb constitutes unsoundness while it lasts, and perhaps while the swelling remains, although the inflammation may have subsided; for a horse that has once thrown out a curb is, for a while, at least, very liable to do so again on the slightest extra exertion.

Cutting, as rendering a horse liable to serious injury of the legs, and indicating that he is either weak, or has an awkwardness of gait inconsistent with safety, may be considered as unsoundness.

Enlarged Glands.—The enlargement of the glands under the jaw has not been so much considered as it ought in our estimate of the soundness of a horse. In a slight affection of this kind, much attention need not be paid; but if the glands are of considerable size, and especially if they are tender, and the gland at the root of the ear partakes of the enlargement, and the membrane of the nose is redder than it should be, we should hesitate in pronouncing that horse sound. We should fear the commencement or the insidious lurking of disease.

Enlarged Hock.—A horse with enlarged hock is unsound. A few days' hard work will always lame him.

The Eyes.—We need not say that a blind horse is unsound. But let the buyer look to it.

Lameness, from whatever cause, is unsoundness.

Neurotomy.—A question has arisen how far a horse that has undergone the operation of the division of the nerve of the leg, and has recovered from the lameness with which he was before affected, and standshis work well, may be considered to be sound. In our opinion there can be no doubt about it. A horse on whom this operation has been performed may be improved,—may cease to be lame; may go well for many years; but there is no certainty of his continuing to do so, and he is unsound.

Ossification of the lateral cartileges constitute unsoundness, as interfering with the natural expansion of the foot, and in horses of quicker work, almost invariably produce lameness.

Pumiced foot.—A pumiced-foot horse must be unsound, and that for ever.

Quidding is unsoundness for the time, but the unsoundness will cease when the teeth are properly filed or the catarrh relieved, or the cause of this imperfect chewing removed.

Quitton is unsoundness.

Ring-bone.—Although, when the bony tumour is small and on one side only, there is little or no lameness, yet from the action of the foot, the inflammation and formation of bone have such a tendency to spread, that we must pronounce the slightest enlargement of the pasterns or around the coronet, to be a cause of unsoundness.

Sandcrack—is manifest unsoundness; but it may occur without the slightest warning, and no horse can be returned for one that is sprung after purchase.

Spavin is unsoundness, whether the bony or blood spavin.

Splint.—It depends entirely on the situation of the bony tumour or the inside of the shank-bone, whether it is to be considered as unsoundness. If it is not in the neighbourhood of any joint, so as to interfere with its action, and if it does not press upon any ligament or tendon, it can by no means be a cause of unsoundness, although it is often very unsightly. It does not lessen the capability and value of the animal.

Springhalt.—This singular and very unpleasant action of the hind leg, cannot be termed unsoundness, and has usually been found in those horses that have a more than common degree of strength and endurance.

Thickening of the Back Sinews.—This will fetter the action of the tendons, and after much quick work will, from the very friction, occasionally renew the inflammation and the lameness. Therefore such a horse cannot be sound.

Thorough Pin, except it be of great size, is rarely productive of lameness, and therefore cannot, when unaccompanied by lameness, be termed unsoundness.

Thrush.—There is difference of opinion with regard to thrush. We confess, however, that we are inclined to consider it as unsoundness. We are compelled to consider it so, according to our definition, that every disease is unsoundness.

Windgalls.—There are few horses perfectly free from windgalls, but they do not interfere with the action of the fetlock, or cause lameness, except when they are numerous or large. They constitute unsoundness only when they cause lameness, or are so large and numerous as to render it likely that they will soon cause it.

CHAPTER V.

CATTLE.

Breeding.—We have already spoken of the most desirable properties of live stock. That which lies at the foundation of the improvement of every kind, or the successful management of it, is the fact,—the common but too much neglected axiom, that "*like produces like.*" This principle extends to form, constitution, qualities, predisposition to and exemption from disease, and to every thing that can render an animal valuable or worthless. It equally applies to the dam and to the sire. It is the foundation of successful and scientific breeding.

The question as to the comparative influence of the sire and the dam, is a difficult one to decide. That farmer will not err, who applies the grand principle of breeding equally to both of them. In the present system of breeding, most importance, and that very justly, is attributed to the male. He is the more valuable animal, and principally more valuable on account of the more numerous progeny that is to proceed from him, and thence his great or general influence; and therefore superior care is bestowed on the first selection of him for rearing. The farmer studies the bull calf closely, and assures himself that he possesses in a more than usual degree, the characteristic of the breed. When this care, as to the possession of such combination of good points, has extended from the sire to the son, through several successive generations, it may be readily supposed that he will possess them in a higher degree than the female can. They will be made as it were, a part and portion of his constitution, and will acquire the power of more certainly, and to a greater extent, communicating them to his offspring. In this way the influence of the sire may, in well bred animals, be considered superior to that of the female; but hers is always great, and must not be forgotten.

At the outset of his career, the farmer should have a clear and determined conception of the object that he wishes to accomplish He should consider the nature of his farm; its abundance or deficiency of pasturage; the character of the soil; the seasons of

the year when he will have plenty or deficiency of food; the locality of his farm; the market to which he has access; and the produce which will there be disposed of with the greatest profit, and these things will at once point to him the kind of beast which he should be solicitous to obtain. The best beast for him is that which suits his farm the best; and, with a view to this he studies or ought to study, the points and qualities of his own cattle, and those of his neighbours. The dairy man will regard the quantity of milk—the quality—the time that the cow continues in milk—its value for the producton of butter or cheese—the character of the breed for quietness, or as being good nurses—the predisposition to red water, garget or dropping after calving—the natural tendency to turn every thing to nutriment—the ease with which she is fattened when given up as a milker, and the proportion of food required to keep her in full milk, or to fatten her when dry. The grazier will consider the kind of beast which his land will bear—the kind of meat most in demand—the early maturity—the quickness of fattening at any age—the quality of the meat—the part on which the flesh and fat are principally laid—and, more than all, the hardihood and the adaptation of constitution to the climate and soil.

In order to obtain these valuable properties, the farmer will make himself perfectly master of the character and qualities of his own stock. He will trace the connection of certain good qualities and certain bad ones, with an almost invariable peculiarity of shape and structure; and at length he will arrive at a clear conception, not so much of beauty of form (although that is a pleasing object to contemplate) as of that outline and proportion of parts, with which utility is oftenest combined. Then carefully viewing his stock, he will consider where they approach to, and how far they wander from, this utility of form; and he will be anxious to preserve or increase the one, and to supply the deficiency of the other. He will endeavour to select from his own stock those animals that excel in the most valuable points, and particularly those which possess the greatest number of these points; and he will unhesitatingly condemn every beast that betrays manifest deficiency in any one important point. He will not, however, too long confine himself to his own stock, unless it is a very numerous one. The breeding from close affinities, the breeding *in-and-in*, has many advantages to a certain extent. It may be pursued until the excellent form and quality of the breed is developed and established. It has, therefore, become a kind of principle with the agriculturist, to effect some change in his stock every second or third year, and that change is most conveniently effected by introducing a new bull. This bull should be, as nearly as possible, of the same sort; coming from a similar pasturage

and climate; but possessing no relationship—or, at most, a very distant one—to the stock to which he is introduced. He should bring with him every good point, which the breeder has labored hard to produce in his stock, and if possible, some improvement, and especially where the old stock may have been somewhat deficient; and certainly he should have no manifest defect of form; and that most essential of all qualifications, a hardy constitution, should not be wanting.

There is one circumstance, however, which the breeder occasionally forgets, but which is of much importance to the permanent value of his stock, as any careful selection of animals can be, and that is, good keep. It is judiciously remarked, "that all good stock must be both bred with attention and well fed." It is necessary that these two essentials, in this species of improvement, should always accompany each other; for without good resources of keeping, it would be vain to attempt supporting a capital stock." This is true with regard to the original stock; it is yet more evident when animals are brought from a better to a poorer soil. The original stock will deteriorate, if neglected and half starved; and the improved breed will lose ground, *even more* rapidly, and to a far greater extent.

The proper age for Breeding.—The proper age at which the process of breeding may be commenced, will depend on various circumstances. Even with the early maturity of the short horns, if the heifers could be suffered to run until they are two years and a half or three years old, they would become finer, larger, and stronger; but the expense of the keep for so long a time is a question that must be taken into serious consideration. The custom which at one period was beginning to be so prevalent of putting the heifer to the male at one year old, or even at an earlier period, cannot be too much reprobated. At the time when they are most rapidly growing themselves, a sufficient quantity of nutriment cannot be devoted to the full developement of the fœtus, and both the mother and the calf must inevitably suffer.

From two to two and a half years old, according to the quality of the pasture, will be the most advantageous time for putting the heifer to the bull. In fair pasture the heifer will probably have attained sufficient growth at two years. If the period is prolonged after three years, and especially with good keep, the animal will often be in too high condition, and there will be much uncertainty as to her becoming pregnant. At an early age, there will often be danger in calving from the heifer not having attained her proper size; and another that has her first calf too late will be in danger from fever.

It will be evident from this that the bull should not be suffered to run with the young stock; and although it is said that cows

are quieter, and thrive better, and are more readily and surely impregnated as they come in season, when they have the bull with them in the pasture; yet it is becoming more the practice, and often very advantageously so, to separate him from them altogether. By watching the cows as they come into season, and keeping them back when the time of parturition would be inconvenient, the farmer will be enabled to get them to calve at the periods that best suit his pasture or his arrangements. The calves may be dropped at the beginning of the year, when veal and butter will yield the greatest profit; or later in the season, when the Spring grass is preparing to come in, and when the young animal will thrive better, and a greater secretion of milk, and the habit of yielding it at every subsequent calving, will be established in the mother.

That which has been said of the best age of beginning to breed in the cow, will equally apply to the bull. It is absurd and dangerous to begin to use him, as some have done, when a yearling. He will come into season at two years old—he will be better at three; and although the farmer may not think it prudent to keep him more than two or three years, he may then be sold advantageously, in his full prime, to another breeder.

Abortion, or Slinking.—The usual period of pregnancy in a cow is nine calendar months, or 270 days; but there is often considerable variation in the time of what seems to be a natural delivery, and when the calf is likely to live.

The cow, however, is more than any other animal subject to abortion. This takes place at different periods of pregnancy, from half of the usual time to the seventh, or almost the eighth month. The symptoms of the approach of abortion, except the breeder is very much among his stock, are very often not perceived.

The cow is somewhat off her feed—rumination ceases—she is listless and dull—the milk diminishes or dries up—the motion of the fœtus becomes more feeble, and at length ceases altogether—there is a slight degree of enlargement of the belly—there is a little staggering in her walk—when she is down, she lies longer than usual, and when she gets up she stands for a longer time motionless. As the abortion approaches, a yellow or red glairy fluid runs from the vagina (this is a symptom which rarely or ever deceives)—her breathing becomes laborious and slightly convulsive—the belly has for several days lost its natural rotundity, and has been evidently falling—she begins to moan—the pulse becomes small, wiry, and intermittent. At length, labour comes on, and is often attended with much difficulty and danger.

If the abortion has been caused by blows or violence, whether arising from the brutality of the keeper, or the animal being

teased by other cows in season, or by unskilfully castrated oxen, the symptoms are more intense.

Abortion is sometimes singularly frequent in particular districts or in particular farms. Sometimes it is occasioned by the extravagantly high condition in which the cows are kept. Acrid plants are often prejudicial to cattle; hard or mineral waters are justly considered as laying the foundation for many diseases in cattle, and for this among the rest. Some careful observers have occasionally attributed abortion to the disproportion in size between the male and the female. Cows that have been long afflicted with hoose (catarrh), and that degenerating into consumption, are exceedingly subject to abortion. An in-calf beast will scarcely have hoose to any considerable extent without afterwards aborting.

The consequences of premature calving are frequently of a very serious nature, and when the case is more favourable, the results are nevertheless often annoying. The cow very soon goes again to heat, but in a great many cases she fails to become pregnant; she almost certainly does so if she is put to the bull during the first heat after abortion. The heat again and again returns, but she does not stand to the bulling; and so the season is wasted, while she becomes a perfect nuisance by continually worrying the other cattle.

If she should come in calf again during that season, it is very probable she will again abort; or that when she becomes in calf the following year, the same fatality will attend her. Some say that this disposition to cast her young gradually ceases, and that in three or four years she may be depended upon as a tolerable safe breeder: he, however, would be exceedingly inattentive to his own interest, who kept a profitless beast so long.

The treatment of abortion will differ little from that of parturition, presently to be described. If the farmer has once been tormented by this part of the dairy, he should carefully watch the approaching symptoms of casting the calf, and as soon as he perceives them, should remove the cow from the pasture to a comfortable cow-house or shed. If the discharge is glairy but not offensive, he may hope that the calf is not dead; he will be assured of this by the motion of the fœtus, and then it is possible that the abortion may yet be avoided. He should hasten to bleed her, and that copiously, in proportion to her age, size, condition, and the state of excitation in which he may find her; and he should give a dose of physic immediately after bleeding. The physic beginning to operate, he should administer half a drachm of opium, and half an ounce of sweet spirit of nitre. He should allow nothing but gruel, and should keep his patient as quiet as he can. By these means he may occasionally allay the general

local irritation that precedes or causes the abortion, and the cow may yet go to her full time.

Should, however, the discharge be fœtid, the natural conclusion will be that the fœtus is dead, and must be got rid of, and that as speedily as possible. Bleeding may even then be requisite, if much fever exists. In other respects, the animal must be treated as if her usual time of pregnancy had been accomplished.

Much may be done in the way of *preventing* the formation of this habit of abortion among the cows. *The fœtus must be got rid of immediately.* It should be buried deep and far from the cow pasture. Proper means should be taken to hasten the expulsion of the placenta. A dose of physic should be given, the ergot of rye as hereafter to be described, should be administered; the hand should be introduced, and an effort made cautiously and gently, to detach the placenta. All violence, however, should be carefully avoided, for considerable and fatal hemorrhage may be speedily produced. The parts of the cow should be well washed with a solution of the chloride of lime, and this should be injected up the vagina, and also given internally. In the mean time, and also after the expulsion of the placenta, the cow-house should be well washed with the same solution.

The cow when beginning to recover, should be fattened and sold. This is the first and the grand step towards the prevention of abortion, and he is unwise who does not immediately adopt it.

Abortion having once occurred on the farm, the breeding cows should be carefully watched. Although well fed, they should not be suffered to get into too high condition. Unless they are decidedly poor and weak, they should be bled between the third and fourth months of pregnancy, and a mild dose of physic should be administered to each. If the pest continues to re-appear, the owner should most carefully examine how far any of the causes of abortion that have been detected may exist on his farm, and exert himself in carefully removing them.

Symptoms of Pregnancy.—The symptoms of pregnancy in its early stage used to be thought unsatisfactory. But that greatest of improvements in veterinary practice (the application of the ear to the chest and belly of various animals, to detect by the different sounds the state of the circulation,) has now enabled the breeder to ascertain the existence of pregnancy at as early a stage of it as six or eight weeks. The beating of the heart of the calf will be distinctly heard, twice or more than twice as frequently as that of the mother; and each pulsation will betray the singular double beating of the fœtal heart. This will also be accompanied by the audible rushing of the blood through the vessels of the placenta. The ear should be applied to the right flank, beginning on

the superior part of it, and gradually shifting downward and backwards. These sounds will soon be heard, and cannot be mistaken.

Treatment before Calving.—Little alteration needs to be made in the management of the cow for the first seven months of pregnancy; except that as she has not only to yield milk for the profit of the farmer, but to nourish the fœtus which is growing in her womb, she should be well, yet not luxuriantly fed. The half-starved cow will not adequately discharge this double duty, nor provide sufficient nourishment for the calf when it has dropped; while the cow in good condition will be dangerously disposed to inflammation and fever, when, at the time of parturition, she is otherwise so susceptible of the power of every stimulus. If the season and convenience of the farmer will admit of it, she will be better at pasture, at least for some hours in the day, than altogether confined in the cow-house.

It has been usual to let the cow go dry for some time before the parturition. Were the period of pregnancy of equal length at all times and in all cows, the one that has been well fed might be milked until within a fortnight or three weeks of parturition; while a holiday of two months should be granted to the poorer beast; but as there is much irregularity about this, it may be prudent to take a month or five weeks as the average period.

Natural Labour.—The springing of the udder, or the rapid enlargement of it from the renewed secretion of the milk; the enlargement of the external part of the bearing (the former, as it has been said by some, in old cows, and the latter in young ones); the appearance of a glairy discharge from the bearing; the evident dropping of the belly, with the appearance of leanness and narrowness between the shape and the udder; a degree of uneasiness and fidgettiness; moaning occasionally; accelerated respiration; all these symptoms will announce that the time of calving is not far off. The cow should be brought near home, and put in some quiet sheltered place.

The natural progress of parturition should not be unnecessarily interfered with. The cow should be frequently looked at, but not disturbed. Although her pains may not be so strong as could be wished she should not be too closely approached or examined, until the water bladder or bag containing the fluid in which the calf has hitherto floated, has protruded and is broken. Soon afterwards it may be proper to ascertain whether the calf is *coming the right way*. In the natural presentation of the fœtus, the calf may be considered as couching or laying on its belly; its fore legs protruding into the passage, its head lying upon them, or being a little between them, and reaching down nearly as far as the knee, and the back of the calf corresponding with or opposed to the back of the mother.

While the throes continue tolerably strong, the farmer or practitioner should have patience, although the progress of the labour may be tedious and slow. Nature will at length safely accomplish her object. But if the pains are evidently diminishing, and hour after hour has passed and the calf protrude little or not at all more than it did, assistance should be rendered. A pint of sound ale, warmed, should be given in an equal quantity of gruel; warm gruel should be frequently administered, or, at least, put within the animal's reach; and access to cold water should be carefully prevented.

To the first pint of ale should be added a quarter of an ounce of the ergot of rye (spurred rye) finely powdered, and the same quantity of the ergot with half a pint of ale should be repeated every hour until the pains are reproduced in their former and natural strength, or the labour is terminated.

Mechanical Assistance.—The power of medicine failing, recourse should be had to mechanical assistance. Twelve hours or more having elapsed from the commencement of the labour, this should be done, even although the calf may continue to be alive; and it should not be deferred one moment after it is ascertained that the fœtus is dead. Even now, however, the cow should not be disturbed more than is absolutely necessary; and it cannot be too deeply impressed on the mind of the farmer, that the cruel habit of rousing the animal and driving her about, while she is in the act of calving, or even before the labour begins, is an unnatural, brutal, and dangerous one.

If the head is sufficiently advanced to be grasped by the hands, or for a hand to be introduced by the side of it so as to urge it forward, an assistant at the same laying hold of the fore legs and pulling with moderate force at each of the throes of the mother, the little animal may often be brought forward without endangering its life. If, however, it is firmly impacted in the passage, a cord with a slip knot should be fastened round each leg immediately above the fetlock, and a third cord around the lower jaw. Greater power may be applied: the persons holding the cords pulling in concert, accommodating themselves to the natural pains of the mother, and exerting their strength, although somewhat forcibly, yet quietly and gradually. Here, again, the brutal violence resorted to by some persons is much to be reprobated; it evidently destroys the calf, and endangers the life of the mother.

Unnatural Presentation.—Persons of all descriptions who have any thing to do with neat cattle, are, or ought to be, well acquainted with the manner in which the calf should present itself, when in a natural or proper position.

All those positions are called unnatural in which the calf presents

itself otherwise than with its head and fore feet first, and its back towards the cow's back. It is well known to all who have the management of cows, or those who practice in medicine amongst them, that calves are very commonly presented in a variety of different postures, for which no just reason can be assigned; and whenever they present themselves in a wrong posture, both cow and calf are in danger, and that more or less, according to the ability of the person employed to give the necessary assistance.

In the first place, then, after the waters are broke, and only the head and one foot present themselves, you must lay hold of the calf's head, and wait till the throes are off, then justly push it back and rectify the other foot; after which it may be extracted without danger.

Secondly, if the head only presents itself, and both feet are left behind, the head must be pushed back with a gentle hand, as soon as her throes are off, and the feet properly placed, with the utmost care, lest by any means you wound or tear the uterus.

Thirdly, if all the fore feet be turned where the back ought to be, towards the top of the uterus, in this situation it will be impossible to extract the fœtus, until it be put in a proper *position*. In operations of this kind, every thing depends upon the management and activity of the person employed, in putting the beast into a favorable posture. The hind parts of a cow must be sufficiently raised with straw, or otherwise with bags, filled with that or anything else that is soft and easy to lie on, and properly placed under her. By these means the person will be very much assisted in putting the calf in a suitable position for extraction; afterwards, wait a little until her throes or pains return, and then give nature your best assistance.

Fourthly, it sometimes happens that the hind legs make their first appearance; in this case it will be found better to extract them in that position, than to attempt to turn them.

Fifthly, instances frequently occur of calves being dropsical in the head; this may be known by the largeness of the latter, in which case, the other parts are generally small and wasted away. Under these circumstances, if the calf cannot be extracted in the common way, the best method will be, to fix a proper cord round each foot, or upon the upper or under jaw, as may be thought most convenient at the time of the operation; and then to assist the animal every time nature attempts to do its office. If, however, the calf be dead, it may be cut away with a proper knife. This requires a person of skill and experience, otherwise he may take the life of the cow.

Sixthly, frequent instances have also occurred where the shoulder has presented itself first at the mouth of the uterus; this is a difficult case, and requires the hand to be introduced

in search for the fore legs, or if it be thought more proper, the hind legs may be brought forward: this must be left to the judgment of the person employed.

Seventhly, it sometimes happens in cases where the calf is dead, or dropsical in the head, that instruments are found necessary to be used: when this is the case, the cow is mostly reduced to a weak, low, and emaciated state. The instrument may be formed out of a small rod of iron, or very strong wire, sufficiently polished, with a small hook at the end; this hook must be so placed in the operator's hand as not to endanger the uterus when introduced; it must then be fixed in some part of the calf's head, as the socket of the eyes, in the mouth, or in any part about the head as may appear most convenient at the time of extraction. Sometimes the fœtus is so enlarged, and the womb so contracted, as not to admit of extraction. It will then be necessary to take it away by pieces. This may be done, but it requires a man to be well skilled in this kind of practice. The knife must be made for the purpose, and the blade be so placed in the ball of the hand, with the fore finger over the point, as to protect the uterus from danger of being wounded.

The falling down of the calf bag is another accident to which some cows are liable. It should be returned as soon as possible. The womb must be first cleansed from all the dirt which it may have gathered. Then let the operator take away the placenta, or cleansing, in the gentlest manner possible, lest an effusion of blood take place and endanger the life of the animal. Afterwards bathe and wash all the parts with a weak mixture of spirits and water. As soon as these have been well washed, her hinder parts must be sufficiently raised, and the person's hand well rubbed over with linseed oil; then endeavour to find the middle part of the calf bag, and by the gentle pressure of the hand, it may in general be replaced with ease and safety.

Sometimes it is with difficulty prevented from falling out the second time; when this is likely to happen, it has been usual to pass two or three stitches of tape through the lips of the bearing; but this is a painful thing, and sometimes difficult to accomplish. A substitute may be found in passing a collar round the neck of the cow, and then by a girth of proper material, connected with it, to secure a piece of stout wrapping cloth or other material over the bearing.

The cow should be kept as quiet as possible; warm mashes and warm gruel should be allowed. Should twenty-four hours pass and the pains not return, the stitches may be withdrawn from the bearing, or the bandage removed.

Free Martins.—The opinion has prevailed among breeders (and accurate inquiries have shown that it is not a mere vulgar

error,) that when a cow produces two calves, one of them a bull calf and the other a cow, the male may become a perfect and useful bull, but the female will be incapable of propagation, and will never show any desire for the bull. The curious name of *free martin* has been given to this animal,

Attention after Calving.—Parturition having been accomplished, the cow should be left quietly with the calf, the licking and cleaning of which, and the eating of the placenta, if it is soon discharged, will employ and amuse her. It is a cruel thing to separate the mother from the young so soon; the cow will pine and will be deprived of that medicine which nature designed for her in the moisture which hangs about the calf, and even in the placenta itself; and the calf will lose that gentle friction and motion which helps to give it the immediate use of all its limbs. A warm mash should be put before her, and warm gruel, or water from which the coldness has been taken off. Attention should likewise be paid to the state of the udder. If the teats are sore, and the bag generally hard and tender, she should be gently but carefully milked three or four times every day. The natural and the effective preventive of this, however, is to let the calf suck her at least three times in the day if it is tied up in the cow house, or to run with her in the pasture, and take the teat when it pleases.

The *placenta* or *after birth* should be discharged soon after the calving. Should the cleansing continue to be retained, some have recommended that a weight of six or eight ounces should be tied to the cord, the gentle and continued action of which will usually separate the placenta from its adhesions without any risk of hemorrhage: but if the after-birth should still remain in the womb, and decomposition should evidently commence, the hand must be introduced into the passage, and the separation accomplished as gently as possible.

Milk (Puerperal) Fever.—Dropping after Calving.—Although parturition is a natural process, it is accompanied by a great deal of febrile excitement. The cow is subject to inflammation of some of the parts, the functions of which are now changed; it is mere local inflammation at first, but the system speedily sympathises, and puerperal fever appears. It is called *dropping after calving* because it follows that process, and one of the prominent symptoms of the complaint is the loss of power over the motion of the hind limbs, and consequent inability to stand.

Puerperal fever sometimes appears as early as two hours after parturition; if four or five days have passed, the animal may generally be considered as safe.

The early symptoms of dropping after calving, are evidently those of a febrile character. The animal is restless, shifting the feet, pawing, and she heaves laboriously at the flanks. The muz-

ale is dry and hot, the mouth open, and the tongue protruded. The countenance is wild and the eyes staring. She wanders about, mournfully lowing; she becomes irritable; butts at strangers, and delirium follows. The udder becomes enlarged, hot, and tender, at the very commencement of the disease. This is always to be regarded as a suspicious circumstance in a cow at that time, and if this swelling and inflammation are accompanied, as they almost uniformly are, by a partial or total suspension of the milk, that which is about to happen is plain enough.

The disease is an inflammatory one, and must be treated as such; and being thus treated, it is generally subdued without difficulty. The animal should be bled, and the quantity of blood withdrawn should be regulated by that standard so often referred to—that rule without an exception—the impression made upon the circulation. From six to ten quarts will probably be taken away, depending upon the age and size of the animal, before the desired effect is produced.

A pound or a pound and a half of Epsom salts, dependent on the size of the beast, must next be administered, with half the usual quantity of aromatic ingredients, such as ginger and carraways, and half pound doses of the same must be repeated every six hours. Should not the medicine soon begin to act, the usual quantity of aromatic medicine must be doubled. *The bowels must be opened*, or the disease will run its course; and purging once established in an early stage, the fever will, in the majority of instances, rapidly subside, leaving the strength of the constitution untouched. After the physic has begun to operate, the usual sedative medicines should, if necessary, be given.

Sore Teats.—Cows are very subject to inflammation of the udder, soon after calving. This, in some cases, shows itself in the form of excoriations or sores, or small cracks or chaps, on the teats, and very troublesome they are. The discharge, likewise, from these, mingles with the milk. The cow suffers much pain in the act of milking, and is often unmanageable. Many a cow has been ruined, both as a quiet and a plentiful milker, by bad management when her teats have been sore. It is folly to have recourse to harsh treatment to compel her to submit to the infliction of pain in the act of milking; she will only become more violent, and probably a kicker for life: if by soothing and kind treatment she cannot be made to stand, nothing else will effect it. She will also form a habit of retaining her milk, and which will very speedily and very materially reduce its quantity. The teats should be fomented with warm water, in order to clean them and get rid of a portion of the hardened scabbiness about them, the continuance of which is the cause of the greatest pain in the act of milking; and after the milking, the teats

should be dressed with the following ointment:—Take an ounce of yellow wax and three of lard, melt them together, and when they begin to get cool, well rub in a quarter of an ounce of sugar of lead, and a drachm of alum, finely powdered.

Garget.—Too often, however, the inflammation assumes another and worse character; it attacks the internal substance of the udder—one of the teats, or the quarters, becomes enlarged, hot, and tender; it soon begins to feel hard, it is knotty, and contains within it little distinct hardened tumours, or kernels. In a short space of time, other teats, or other quarters, probably assume the same character. The milk has coagulated in the bag to a certain degree, and it has caused local inflammation where it lodges. This occurs particularly in young cows, after their first calving, and when they are in a somewhat too high condition, and it is usually attended by a greater or less degree of fever.

The most effectual remedy for this, in the early stage of the complaint, is a very simple one; the calf should be put to the mother, and it should suck and knock about the udder at its pleasure. In most cases this will relieve her from the too great flow of milk, and disperse all the lumps.

If the inflammation continues, or increases, or the bag should be so tender that the mother will not permit the calf to suck, and especially should the fever evidently increase, and the cow refuse to eat, or cease to ruminate, and the milk become discoloured, and mixed with matter or with blood, the case must be taken seriously in hand. The cow should be bled; a dose of physic administered; the udder fomented; the milk drawn gently but completely off, at least twice in the day; and an ointment composed of the following ingredients, as thoroughly rubbed into the bag as the cow will permit:—(Rub down an ounce of camphor, having poured a tea spoonful of spirit of wine upon it; add an ounce of mercurial ointment, and well incorporate them together.) Let this be applied after every milking, the udder being well fomented with warm water, and the remains of the ointment washed off before the next milking.

Whenever there is any appearance of suppuration having commenced, (a minute observation will enable one to discover the very spot at which the tumour is preparing to point,) the diseased part should be deeply and freely lanced; and an immense quantity of matter will often be discharged. It is generally bad practice to cut off the teat: not only is it afterwards missed in the milking, but the quantity of the milk is usually lessened to a greater or less degree.

Should the tumour have been left to break, a deep and ragged ulcer will then be formed, and must immediately be attended to.

The chloride of lime is an invaluable application here. The wound should be well cleansed with warm water, and then a dilute solution of the chloride freely applied to every part of it; not only will the unpleasant smell from the ulcer be immediately got rid of, but its destructive progress will be arrested, and the wound will speedily take on a healthy character.

The causes of garget are various; the thoughtless and unfeeling exposure of the animal to cold and wet, at the time of or soon after parturition, the neglect of physic or bleeding before calving, or suffering the cow to get into too high a condition, are frequent causes. So also may be enumerated the hastily drying of the cow, and the careless habit of not milking her clean.

The Calf.—In whatever manner the calf is afterwards to be reared, it should remain with the mother for a few days after it is dropped, and until the milk can be used in the dairy. The little animal will then derive the benefit of the first milk, that to which nature has given an aperient property, in order that the black and glutinous fæces that had been accumulating in the intestines during the latter months of the fœtal state, might be carried off. The farmer acts wrongly when he throws away, as he is too much in the habit of doing, *the beastlings* or first milk of the cow.

The calf being cleaned and having begun to suck, the navel string should be examined. Perhaps it may continue slowly to bleed. In this case a ligature should be passed round it closer, but if it can be avoided, not quite close to the belly. Possibly the spot at which the division of the cord took place, may be more than usually sore. A pledget of tow greased with a little emollient ointment may be placed over it, confined with a bandage, and changed every morning and night, but the caustic applications should be avoided.

If the first milk or *beastlings* has been taken from the calf, and *constipation* from that or any other cause succeeds, an aperient should be administered without delay. Castor oil is the safest and most effectual aperient for so young an animal. It may be mixed up with the yolk of an egg, or in thick gruel, and given in doses of two or three ounces,—a scruple of ginger should be added to the oil.

All tendency to costiveness in a calf should be obviated as speedily as possible.

The disease, however, to which calves are most liable, and which is most fatal to them, is purging. The farmer need not be alarmed, although the fæces should become thin and continue so during two or three days, if the animal is as lively as usual and feeds as he was wont. But if he begins to droop, if he refuses his food, if rumination ceases and he is in evident pain, and mucous and perhaps blood begins to mingle with the dung, and that

is far more fœtid than in the natural state, not an hour should be lost. A mild purgative (two ounces of castor oil, or three of Epsom salts) should first be administered, to carry away the cause of the disturbed state of the bowels. On this should follow anodyne, and astringent, and alkaline medicines, with a mild carminative. The whole will consist of opium, catechu, chalk and ginger. The proportions are, one ounce of the first, one drachm of the second, and four drachms of the third, and two of the last for each dose for full grown cattle, and to be administered in thick gruel; the dose here will be varied with the age.

Calves as well as adult cattle are subject to *hoose* (catarrh), but as this disease with its treatment will be hereafter described, that will be a guide for the treatment of the calf.

Castration.—The period which is now pretty generally selected for this operation, is between the first and the third months. The nearer it is to the expiration of the first month, the less danger attends it.

This should be done when the animal is in perfect health, and the mode formerly practised was simple enough;—a piece of whipcord was tied as tightly as possible round the scrotum. The supply of blood being thus completely cut off, the bag and its contents soon became livid and dead, and were suffered to hang until they dropped off, or were cut off, on the second or third day.

The new practice is, to grasp the scrotum in the hand, between the testicles aud the belly, and to make an incision on one side of it, near the bottom, of sufficient depth to penetrate through the inner covering of the testicle, and long enough to admit of its escape. The testicle immediately bursts from its bag, and is seen hanging by its cord. A piece of small string is then tied firmly round, not including the cord, to prevent hemorrhage, and the rest of the cord is then divided. The other testicle is proceeded with in the same way, and the operation is complete. The length of the cord should be so contrived that it shall immediately retract into the scrotum, but not higher, while the ends of the strings hang out through the wounds. In the course of about a week, the strings will usually drop off, and the wounds will speedily heal. It will be rarely that any application to the scrotum will be necessary, except fomentation of it, if much swelling should ensue.

THINGS TO BE CONSIDERED IN BREEDING CATTLE.—The things to bé kept in view in breeding cattle are, forms well adapted for fattening, for producing milk, or for labour. These three objects have each of them engaged the attention of agriculturists, but experience has not hitherto justified the expectation that had been entertained of combining all those desirable properties, in

an eminent degree, in the same race. The form which indicates the properties of yielding the most milk, differs materially from that which we know from experience to be combined with early maturity, and the most valuable carcass. And the breeds which are understood to give the greatest weight of meat for the food they consume, and to contain the least proportion of offal, are not those which possess in the highest degree the strength and activity required in the beasts of labour.

The marks of a well-made bull, to whatever breed he may belong, are as follows: The head should be rather long and muzzle fine, his eyes lively and prominent, his ears long and thin, his horns wide, his neck rising with a gentle curve from the shoulders, and small and fine where it joins the head; the shoulders moderately broad at the top, joining full to his chine or crop, and chest backwards, and to the neck vein forwards; his bosom open, breast broad and projecting well before his legs; his arms or fore thighs muscular, and tapering to his knees; his legs straight, clean, and very fine boned; his chine and chest so full as to leave no hollows behind the shoulders; the plates strong, to keep the belly from sinking below the level of his breast; his back or loin broad, straight, and flat; his ribs rising one above another, in such a manner that the last rib shall be rather the highest, leaving only a small space to the hips or hooks, the whole forming a round or barrel-like carcass; his hips should be wide-placed, round, or globular, and a little higher than the back; the quarters, from the hip to the rump, long, and instead of being square, as recommended by some, they should taper gradually from the hips backwards, and the turbs or pott-bones not in the least protuberant; rump close to the tail, the tail broad, well haired, and set on high, so as to be in the same horizontal line with the back. Bulls should be constantly well fed, and kept in proper inclosures, never being suffered to ride before they are three years old, as when the contrary is the practice, they never attain a perfect growth. It is observed by Lawrence that the above description delineates that barrel shape which Bakewell supposed most advantageous for all kinds of animals intended to be fed for slaughter, or even for labour.

The marks of excellence in neat cattle in general are thus given by an eminent breeder:—The head ought to be rather long, and muzzle fine; the countenance calm and placid, which indicates a disposition to get fat; the horns fine; the neck light, particularly where it joins the head; the breast wide, and projecting well before the legs; the shoulders moderately broad at the top, and the joints well in, and when the animal is in good condition, the chine so full as to leave no hollow behind it; the fore flank well filled up, and the girth behind the shoulders deep; the back

straight, wide, and flat; the ribs broad, and the space between them and the hips small; the flanks full and heavy; the belly well kept in, and not sinking low in the middle, but so formed that a cross section of it would resemble an oval, whose two ends are of the same width, and whose form approaches that of a circle, or of an ellipsis whose eccentricity is not great (the whole forming, not a round or barrel-like carcass, as some have expressed it, for this would leave a deficiency both in the upper and lower part of the ribs); the hips globular, wide across, and on a level with the back itself; the hind quarters, that is from the hips to the extremity of the rump, long and straight; the rump points fat, and coming well up to the tail; the twist wide, and the seam in the middle of it so well filled, that the whole may very nearly form a plain perpendicular to the line of the back; the lower part of the thigh small; the tail broad and fat towards the top, but the lower part thin; the legs straight, clean, and fine boned; and when the animal is in high condition, the skin of a rich and silky appearance. These appear to be the most material points for the formation of true symmetry in cattle; there are others of a minor consideration, which will readily be suggested by attention and experience.

The marks of an ox well adapted to labour differ from the above only in requiring long and strong legs, and broad hardy feet and hoofs.

The marks of a good cow are these: wide horns, a thin head and neck, dew lap large, full breast, broad back, large deep belly; the udder capacious but not too fleshy; the milk veins prominent, and the bag tending far behind; teats long and large, buttocks broad and fleshy; tall, long, and pliable legs, proportionable to the size of the carcass, and the joints short. To these outward marks may be added, a gentle disposition, a temper free from any vicious tricks, and perfectly manageable on every occasion. On the other hand, a cow with a thick head and a short neck, prominent back bone, slender chest, belly tucked up, small udder or fleshy bag, short teats and thin buttocks, is to be avoided as totally unfit for the purposes either of the dairy-man, the suckler, or the grazier.

The marks of excellence in cattle as derived from colour are of no importance, and all that can be said, is, that white and red cattle are less hardy than black-haired.

The marks of age in cattle are derived from their teeth and horns. At the end of about two years they shed their first four teeth, which are replaced by others, longer, but not so white; and before five years all the incisive teeth are renewed. These teeth are at first equal, long, and pretty white, but as the animals advance in years, they wear down, become unequal, and grow black. These animals, according to some, likewise shed their horns at

the end of three years; they are replaced by other horns which like the second teeth, continue; this, however, is totally or partially denied by practical men. The manner of the growth of the horns is not uniform, nor the shooting of them equal. The first year, that is the fourth year of the animal's age, two small pointed horns make their appearance, neatly formed, smooth, and towards the head terminated by a kind of button. The following year this button moves from the head, being impelled by a horny cylinder, which lengthening in the same manner, is also terminated by another button, and so on; for the horns continue growing as long as the animal lives. These buttons become annular joints or rings, which are easily distinguished in the horn, and by which the age of the creature may be easily known; counting three years for the point of the horn, and one for each of the joints or rings. The cow continues useful for more than twenty years, but the bull loses his vigour much sooner. Dealers sometimes obliterate these rings, by shaving the horns, in order to conceal the age of the beast.

A young castrated male, after the first year, is called a yearling; when a year older, a steer; at five years old, an ox. A female after the first year is called a heifer, when about to bring a calf she is called a young cow. A castrated female is called a spayed heifer.

REARING CALVES.—The mode of rearing calves is various. There can be no doubt but that the best and most natural mode is that of allowing them to suck their dams, at least for some length of time after they are brought forth.

When calves are designed for veal they should be taken from the mother after the first two or three days; they should be permitted to suck two or three times a day until they are satisfied; or some say, give them only two teats during the first week, three during the second, and the whole of the milk the third and fourth weeks, when they are fit to kill.

But when a calf is intended to be reared, it should be taken from the mother after the first four days, or it may be continued with her three or four weeks, during which time it should be taught to drink. There is generally not much difficulty in this; some calves will at once, when their noses are put to the pail, find the way themselves. It is particularly to be observed, that the milk should be given to them as warm as possible from the cow, or otherwise made artificially warm, as they will take it in that state in a much readier manner. When the calf requires assistance, the milk being at hand in the pail, a couple of fingers are given it to suck, and gradually sunk amongst the milk in the pail. If the first attempt fails, it will generally succeed in the end.

When the calf has been a few weeks upon sweet milk, and the weather has got moderately mild, it may be put upon more economical diet, skim milk being substituted, and a little fresh hay if it is out of grass season. This diet may be made very nourishing by boiling a little flax seed to mucilage, and mixing a couple of table spoonsfull of it with the same quantity of molasses, the whole to be stirred up with warm skim milk, and given in sufficient quantities three times a day. When the feeding time is over, and the animal has got perfectly stout and well. (if it has been castrated) it should be turned into a fine calf pasture, with abundance of sweet grass, and supplied with plenty of water through the season. At the close of fine weather it should be brought back to the sheds, have a warm berth given to it, and be well fed with cut or steamed roots, which are better, and fresh hay. By this treatment, the animal will continue to grow the whole Winter. The next season it should be kept in a small field of good clover, where it can have access to water, and by visiting the field often and carrying a little salt occasionally, it will become perfectly domesticated, and retain its docile habits ever after.

By this method very fine animals may be raised; but where the object is to raise a very superior breed, this system should be departed from, and the animals have every favourable chance given them of coming forward. To this end the calf should be kept up the first four weeks, being permitted to suck its dam three times a day. If the weather is then sufficiently mild, and the calf strong, it may be turned out to pasture with its mother, and permitted to suck her until the early part of October, when it should be taken away and treated in the most careful manner throughout the Winter and the succeeding Summer; at two years such an animal will generally be as forward as most others at three. By pursuing this method for a few generations, it is probable that extraordinary habits of early maturity may be made concomitant with the other valuable qualities which distinguish the best breed.

When fed from the pail, the average allowance to a calf is about two gallons of milk daily, for twelve or thirteen weeks; at first fresh milk as it is drawn from the cow, and afterwards skim milk. But after it is three or four weeks old, a great variety of substitutes for milk are used in different places, such as linseed oil cake, meal, turnips, &c.

Where calves are reared with skim milk, it should be boiled, and suffered to stand until it cools to the temperature of that first given by the cow, or a trifling degree warmer, and in that state it should be given to the calf. Milk is frequently given to calves warm only, but that method is not so good as boiling. If the milk be given over cold, it will cause the calf to purge. When

this is the case put two or three spoonsfull of rennet in the milk, and it will soon stop the looseness. If, on the contrary, the calf is bound, bacon or pork broth is a very good and safe thing to put into the milk. One gallon of milk per day will keep a calf well at first. The usual allowance is about double after the first eight or ten days, and this is increased according to the age of the animal. After it is thirteen weeks old, it will do very well upon grass, or other food, without any milk at all. A calf may then be supported without milk, by giving it hay and a little wheat bran once a day, with about a pint of oats. The oats will be found of great service as soon as the calf is capable of eating them. The bran and oats should be given about mid-day; the milk in portions, at eight o'clock in the morning and four in the afternoon. But whatever hours are chosen to be set apart for feeding the calf, it is best to adhere to particular times, as regularity is of more consequence than many people think. If the calf go but an hour or two beyond the usual time of feeding, he will find himself uneasy, and pine for food. It is always to be understood, that calves reared in this manner, are to be enticed to eat hay as early as possible, and the best way of doing this, is to give them the sweetest hay that can be got, and but little at a time. Turnips or potatoes are very good food as soon as they can be eaten by them; and they are best cut small and mixed with hay, oat bran, and such articles. It may be observed that it is not absolutely necessary to give milk to calves after they are one month old; to wean them gradually, two quarts of milk with the addition of linseed boiled in water, to make a gruel, given together, will answer; and by diminishing the milk gradually, the calf will soon do without it. Hay tea will do, with the like addition of two quarts of milk, but it is not so nutritious as linseed. It is a good method of making this, to put such a proportion of hay as will be necessary into a tub, then to pour on a sufficient quantity of boiling water, covering up the vessel, and letting the water remain long enough to extract the virtues of the hay. When bacon or pork is boiled, it is a good way to preserve the liquor or broth, and mix it with milk for the calves.

The best time for rearing calves, is the Spring; but that operation must depend in some degree on the time when the calf was dropped. Such as are weaned during the Autumn or Winter, however, seldom do so well. At the season when the calf is weaned from the teat, it ought to be turned abroad in the day time into a small close or orchard near the yard, where there is a good bite of grass, which may be expected at the time of the year when the weaning calves are of this age, and as there will generally be more than one calf to be weaned, in a season, they will each be company for the other, and become in a short time recon-

ciled to their situation. It is to be observed that this pasture should be at some distance from that whereon the dams are turned, and that there be neither ponds nor ditches, nor any annoyance which might endanger the life of the youthful animals; and in order to habituate them still more to their pasture, milk pottage should be carried to them, at each of their feeding hours. For the first month or six weeks the calves ought every night to be brought home and lodged in the pens; but after that time they may be left in the pasture as well in the night season as in the day, and at this time their food may be lowered by degrees, till it be at length reduced to simple water only; for when the calves are got to the age of twelve or fourteen weeks, they will no longer require the aid of this sustenance, but will be able to satisfy their appetite with grass.

FATTENING CATTLE.—The fattening of cattle demands considerable and constant attention, and the great object is to fatten quickly. An animal when in a state of rearing, may be considered as a vessel open at both ends, in which the supply and the waste being nearly equal it can never be filled; fattening the animal may be considered as an attempt to fill the vessel, and this can only be done by excess of supply. The waste being the same as before, the excess must be great; if it is not so, the vessel may be filled to a greater height than before, without ever becoming full. An important hint might be taken from this simile, by many farmers, who know little of the difference between feeding and fattening. Cattle, sheep, and swine may be kept for months, and fed with a view to fattening them, without their gaining a pound of meat.

The age at which cattle are fattened depends upon the manner in which they have been reared; upon the properties of the breed in regard to the propensity to fatten earlier or later in life, and on the circumstance of their being employed in breeding, in labour, for the dairy, or reared solely for the butcher. In the latter case the most improved breeds are fit for the market when about three years old, and very few of any large breed should be kept more than a year longer. As to the cows and working oxen, the age of fattening must necessarily be more indefinite; in most instances the latter should be put up to feed after working three years, or in the seventh or eighth year of their age.

The food on which cattle is fattened in Summer is grass, commonly on pastures, but in some instances, cut and consumed in the yard (see article *Soiling*, p. 150). In Winter, hay and roots, and perhaps Indian corn, meal, &c., are used.

When cattle are fattened on grass, the best way is to take

young cattle, particularly three or four year old steers, in November, to keep them in the yard all Winter, fed partly with straw and partly with hay, but so as to have them in good order in the Spring; and these cattle should not be of the largest sizes, but rather middling, such as will come to about 600 weight the four quarters when fattened. They must have good pasture for four months. But as we cannot control the seasons, in case a severe drought takes place, the only remedy is a little grain, or rather meal, given daily. Provided they are thus fed, they will be ready for sale by the middle of September, and generally at this time cattle of the above size are in good demand; if kept later, the markets are glutted, and the price always lower.

Stall-feeding, however, is common, and when judiciously conducted, probably the most eligible method; but the practice of stall-feeding with grain and oil-cake is to be condemned, because it is the most expensive method of sustaining animals. Whatever superfluous grain is raised above the quantities necessary for actual domestic consumption and seed, should be sold, and the money laid by to defray the charges of husbandry; but feeding up the grain, and purchasing oil cake and salt into the bargain, for a contingency which is altogether speculative, is, we think, very injudicious; for the average price of beef in the Spring of the year, rarely warrants such an expensive method of keeping it up.

With respect to feeding, the first rule is, a little at a time and often; because experience has shown that animals that eat much in a short time, do not fatten so well as those which eat less, but more frequently.

The two great points in feeding animals to profit are, regularity, and a particular care of the weaker individuals. On the latter account, there ought always to be plenty of trough or rack room, that too many may not feed together, in which very common case the weaker are not only trampled down by the stronger, but they are worried and become cowed and spiritless, than which there cannot be a more unfavourable state for thriving; besides, these are ever compelled to shift with the worst part of the food. This domineering spirit is so remarkably prevalent among horned cattle, that the master-beasts may often be observed running about and absolutely neglecting their own provender, for the sake of driving the inferior from theirs. This is much oftener than is suspected, the chief reason of that difference so visible in a lot of cattle, after a Winter's keep. The weaker animals should be withdrawn and fed apart; or the master-beasts should be tied up during their meals. With respect to feeding, it is recommended, from good aurity, to begin the course with cabbage and turnips, then to employ carrots and potatoes, and lastly, Indian, oat, or barley meal,

Cabbages are said to possess the property of fattening cattle, not only more expeditiously, but in less proportion than turnips; an acre of the former having been found to fatten one in four more than the same extent of the latter crop. A cow will eat from 100 to 150 lbs. of cabbage per day.

Carrots.—This root is said to have the advantage of turnips, not only in its being a richer and more nourishing food, and in yielding a larger produce, but also in never being annoyed or hurt by insects, and therefore an unfailing crop.

Carrots when fed with mangel wurtzel, in the proportion of one-third of the former to two-thirds of the latter, with a little clover or other hay, were found to be as one to five in fattening cattle, when compared with the Indian corn, and a proportional quantity of hay. (*Com. of J. Williams, Esq., Mem. of Penn. Ag. Soc.*)

Turnips.—Cattle are fed with turnips, either by being tied to upright posts within doors, or they are suffered to go at large in the straw yard. This last is greatly the better mode of feeding, the turnips being supplied from troughs or otherwise, and a shed for shelter being always at hand, and open to the cattle to repose in. It is well, however, that too many animals of strength and size be not put together, lest they disturb each other's feeding. When cattle are of value and put up for quick fattening, it is common to cut off the leaves and tails of the turnips, giving the leaves to the younger and less valuable stock, and the bulbs only to those which are to be fed.

Young cattle not intended to be immediately fattened, receive only a limited portion of turnips, their principal provender being straw. By receiving a portion of turnips with their drier provender, these animals are kept in a much more healthy condition than if confined to the latter food, and continue to grow throughout the whole season, instead of pining away at the time when green herbage can no longer be found for them.

Cattle fatten much faster with clean turnips than with such as are dirty, and therefore they should never be given without being previously washed. Dirty turnips are apt also to scour them.

As turnips are generally topped when they are laid up, these tops may be fed out so long as they last.

Cattle fed on turnips are said to make better beef than when fed on oil cake, it being usually rather rancid when made up into this article. Calves are easily taught to eat them, by tempting them with small pieces at first, and soon become fond of them; and if fed abundantly with them will hold their condition and continue to grow the whole Winter, which insures the desirable point of early maturity. Animals who have plenty of turnips scarcely ever wish to drink. Cows have been kept a whole Winter within doors, on turnips, and never wanted water.

The result of feeding two steers twenty-five weeks upon turnips and straw, the turnips half Swedes or ruta baga, are given in the Quarterly Journal of Agriculture. The steers were half and two-thirds short horned blood. One gained 406 lbs. and the other 336. The daily consumption of turnips was about 200 lbs per day, to each. Four bullocks fed seventy days upon ruta baga, at the rate of two bushels per day each, eating scarcely any thing else, and refusing oil cake, produced for the turnips thus fed $75. They required no drink.

Potatoes.—In the application of potatoes, as food for live stock, they are often joined with hay, straw, chaff, and other similar matters, and have been found useful in many cases, especially in the later Winter months. They are much more nutritive when boiled than in their raw state. They were formerly cooked in this way, but are now very generally steamed. Washing was formerly a tedious disagreeable business, but it is now rendered an easy matter, whether on a large or small scale, by the use of the washing machine.

Every creature appears to relish potatoes, particularly when they are steamed or carefully boiled. It is asserted that a cow may safely eat them in a raw state to the extent of perhaps fifty pounds per day, provided the eyes have broken and begin to shoot. Whenever they are given raw, however, they should be chopped into pieces to prevent accidents. The utility of raw potatoes, is, however, doubted by many. Perhaps straw, hay, and chaff, might be employed as a very proper adjunct, with a few ounces of salt added to each feed.

Mangel Wurtzel.—"Two oxen were fed abundantly on Swedish turnips and mangel wurtzel, and the result was that they increased in weight, each of them, when upon mangel wurtzel, much more rapidly than when upon Swedish turnips, in proportion to the weight which they consumed. I next year," says the writer, "tried the same sort of experiment on a single beast, and the result was similar but rather more favourable to mangel wurtzel. It is said that giving large quantities of mangel wurtzel to beasts in a low condition has been found very dangerous, but I have never found any bad effects from it, either to cattle or sheep. It sometimes happens that when oxen are first put to mangel wurtzel, after coming from the pastures, it disagrees with one or two individuals; in this case I cease giving it to these for one or two days, and when put to it again, it has always agreed with them very well."

A writer in the Genesee Farmer prefers mangel wurtzel to turnips as food for cattle (see p. 133).

Indian Corn, Indian, Oat, and Barley Meal, are all employed in fattening cattle. Indian Corn is sometimes sown to be used

as fodder in its green state. In this case it is cut and fed out when the ears are in the milk. An acre of ground perfectly managed will, in this way, yield twelve tons of green fodder, probably a richer and more nourishing food than any yet known.

Some persons are in the habit of taking the tops from the corn at a proper season. These should be immediately conveyed to a suitable place, and two days' sun will convert them into the best fodder the farm produces. The main body of the stalks too, with the blades, after the ears are harvested, should be cut close to the ground, cured, and taken to the sheds. They should be cut or chaffed with the straw-cutter, and when given alone or with other food, will be a much more nourishing aliment.

Besides the ordinary mode of feeding Indian meal, it has been suggested, on the authority of a practice which prevails in France, whether this might not be beneficially fed in a fermented state. A writer asserts that oxen made half fat, or in good plight, on grass or turnips, are then finished in France upon a sour food prepared as follows: *Rye-meal* (for which Indian or buckwheat may be substituted) with water, is made into paste, which in a few days ferments and becomes sour; this is then diluted with water and thickened with *hay*, cut into chaff, which the oxen sometimes refuse the first day; but when dry, they drink and prefer it. All the husbandmen are decidedly of opinion that they fatten much better, because of the acidity. They give it three times a day, and a large ox eats 22 lbs a day.

The practice of grinding Indian corn and cobs together, has been successfully adopted in some places, as furnishing a superior provender. This is stated to be the case in the west; and a gentleman in Shrewsbury, Mass., has for seven or eight years used corn and cobs cracked and ground together, and says it is the best food he has ever used for fattening cattle.

A little town near Franckfort in Germany, is noted for its remarkable fine cattle. They are fed in the following manner:—Straw is cut short by means of a straw-cutter; it is then put into a cauldron, with the addition of potatoes and carrots, and boiled till it forms a kind of jelly; this mixed with a sufficient quantity of water, is served to the beasts. The animals so fed require no water, and so well do they thrive on this mess, that they are, notwithstanding the Summer labour, ready for the butcher at the end of the year.

All sorts of grain, which is intended to be given to cattle or horses, is best ground. In order to obtain the greatest benefit from it, boil it in water, and while hot add cut straw, stirring it well, and when cool it will be fit to feed out.

Mr. Landon, of Litchfield, Conn., found that by boiling two quarts of flax seed, which was sprinkled on cut straw that had

been previously scalded and seasoned with salt, together with oil cake and oat-meal, and these materials worked together in a tub, with a short pronged fork, he produced a mash on which he fattened a heifer and an ox, which netted him more than he had cleared before in fattening oxen and cows for fifteen years; and he ascribed it chiefly to the use of the flax seed.

A very successful rearer and breeder of neat cattle in Mass. (Col. Jaques), recommends from actual experience the following: Take two bushels of ruta baga cut fine; one bushel of wheat bran; half a bushel of powdered oil cake; English hay, barley straw, and salt hay *cut*, of each seven bushels; water, ten gallons. Let these be perfectly mixed. Give a bushel of this mixture to a cow of the common size every night and morning, and proportionably to greater or smaller animals.

Hay, straw, corn tops or blades, and even the stalks, afford abundant more nourishment when cut or chaffed with a straw-cutter. One bushel of chaffed hay at a mess, given in a trough three times in twenty-four hours, is sufficient for a horse, ox, or cow, and is equal nearly to a third more of that quantity given in the ordinary way.

Salt your clover and other succulent as well as coarse hay. But over salting diminishes the nutriment. More than a peck to a ton is superfluous. Half that quantity is often sufficient. Feeding your stock by weight and measure of food, will not only save provender by its orderly distribution, but frequently saves the lives of animals, too often starved by neglect, or gorged and destroyed by profusion.

Raw and prepared food.—Unless food be thoroughly deprived of its vegetative powers before it enters into the stomach, the whole nourishment which it is capable of affording cannot be derived from it. In the case of the leaves and stalks of vegetables, this is generally effected by mastication; but it requires some care to accomplish it in case of grains. Hence the advantage of mixing corn given to horses or cattle, with chaff or chopped straw, and hence it is supposed by some, that the instinct which fowls have to swallow small stones, is intended by nature for the same object. But the most effectual mode of destroying the living principle, is by the application of heat; and if vegetable food of every kind could be steamed or boiled before it is given to animals (at least in Winter, and in fattening for the market or feeding for milk), it is rendered probable, by analogy and experiment, that much more nourishment would be derived from it.

An apparatus for steaming food for cattle should be considered as a necessary appendage to every arable and dairy farm, of a moderate size. It has been long known that many sorts of roots, and particular the potato, become much more valuable by under-

going this sort of operation. And it is equally well known that when thus prepared they have been employed alone as a substitute for hay, and with cut straw both for hay and corn, in the feeding of horses as well as other animals. To a farmer who keeps many horses or cattle, or even swine or poultry, the practice of boiling their food in steam is so great a saving and advantage, that it deserves the most particular attention. Though potatoes have often been given raw to both horses and cattle, they are found to be infinitely preferable, when cooked by steam, as they are thereby rendered much drier and more nutritive. Turnips and other roots are also much improved, as food for cattle, by a similar process.

Boiled clover-hay is found very good for keeping swine, during Winter; and we are of opinion that if fed to milch-cows, during that season, it would greatly improve the quantity of their milk, and keep them in better order then when fed dry to them. We believe this to be well worthy of a fair experiment, by having a vat or box to hold the hay sufficiently large for the purpose.

A steam boiler is generally made by setting a kettle, holding twelve gallons or more, in a furnace of brick or stone; and over this a hogshead with one head taken out, and the other bored full of holes, is set so close, that the steam of the kettle, when boiling, can only rise through the holes, and thence ascend among the articles to be boiled in the hogshead, and pass off at the top. In this way a hogshead full of potatoes will be nearly as soon boiled as a small part of them only could have been, if placed in the kettle underneath.

As the kettle must be so closed as to prevent any steam passing off, but through the bottom of the hogshead or vat, a pipe or tube must be set in one side, through which, with the aid of a tunnel, the water is poured into the kettle, as often as occasion may require. When poured in, the tube is to be stopped with a plug for the purpose.

Grain of all kinds may be steam-boiled to great advantage, for feeding and fattening cattle; but in that case, it is requisite to have the bottom of the hogshead covered with a cloth, to prevent the grain running down through the holes.

By experiments which have been accurately made in Pennsylvania, upon Indian corn and potatoes, used for fatting swine, it was found that they increased in weight one-third faster on the boiled than on the unboiled food; or, in other words, they gained three pounds when fed on the former, where they only gained two pounds when fed on the latter. We are fully of opinion, that steam-boiling food, for feeding or fattening all sorts of cattle, generally increases the value of the food as much as forty or fifty per cent.

Management of Dairy Cows.—Milch cows are kept for the manufacture of butter and cheese, for the suckling of calves, and for the immediate use of the milk.

Where butter is the principal object, such cows should be chosen as are known to afford the best milk and cream, and the largest quantity, of whatever breed they may be. But the weight of butter to be made from a given number of cows, must always depend on a variety of contingent circumstances; such as the size and goodness of the beasts; the kind and quantity of the food; and the distance of time from calving. As to the first, it needs scarcely to be mentioned, that a large cow will give a greater store of milk than one of a smaller size; though cows of equal size differ as to the quantity of cream produced from the milk of each; it is therefore on those cows, whose milk is not only in large abundance, but which from a peculiar inherent richness yields a thick cream, that the butter dairyman is to place his chief dependence; and where a cow is deficient in either of these, she should be parted with, and her place supplied by one more proper for this use. As to the second particular, namely, the kind and quality of the food, those who would wish to profit by a dairy, ought to provide for their cows hay of a superior goodness to be given them in the depth of Winter, and this in an unlimited degree, that they may always feed until they are perfectly satisfied. When cheese is the principal object, the management in respect to the cows must be the same.

Those cows which will give the greatest quantity of milk, are most profitable for suckling calves, for rich milk is said not to be so proper food for calves as milk which is less valuable for dairy purposes. Milk which contains a large proportion of cream, is apt to clog the stomach of calves; obstruction puts a stop to their thriving, and sometimes proves fatal. For this reason it is best that calves should be fed with the milk which first comes from the cow, which is not so rich as that last drawn.

A milch cow is in her prime at five years old, and will generally continue in a good milking state till ten years old or upwards, exhibiting marks of old age much earlier than others.

Cows of large size yield great store of milk when turned on pastures where the grass is in sufficient abundance, or fed with a constant supply of such food, as from its succulency conduces much towards the nutriment of the creature, and enables her to give large quantities of milk, such as turnips, grains, garden vegetables, &c. But as these large cows require a more ample provision than would fall to their share on the generality of farms, it would seem that they should not be kept by those farmers whose land is not of the most fertile kind, for on ordinary keep a small cow will yield a fairer profit.

In the management of milch cows, it is essential that they be kept at all times in high health and in good condition. If they are allowed to fall in flesh during Winter, an abundant supply of milk need not be expected by bringing them into high condition in the Summer. So well convinced of this are the Germans who attend the Philadelphia market with milk, that they regularly feed their cows at midnight with short feed during the Winter. If cows are lean when calving, no management afterwards will ever bring them to yield for that season any thing like the quantity of milk which they would have furnished had they been kept all Winter in high condition. Cows ought to be kept to their fullest stretch of milk from the time of their calving till grass can be had in abundance. Give a cow half a bushel of carrots, turnips, or other good roots per day, during the six Winter months, besides her hay; and if her Summer feed be such as it should be, she will give nearly double the quantity of milk she would afford, if only kept during the Winter in the usual manner.

It should be remembered, too, that when cows are fed with roots they consume less hay, and are less liable to several diseases, which are usually the effects of poor keeping.

The provision of food for cows must be looked upon as the prime concern in the dairy business; for such a constant daily draught upon the animal juices, cannot be answered but by aid of the most ample supply, even to satiety, of nutritious or succulent food. Natural grass is the first and best of all food for domestic animals. Of the artificial grasses, *lucerne* stands first, and green tares are a very succulent food for milch cows. Here too, the soiling system, where it is deemed advantageous, may be resorted to.

Carrots are an excellent Winter food, indeed the best of the root kind. Mangel Wurtzel also affords a plentiful supply, and is considered by some the best and most profitable roots that can be raised for milch cows. If potatoes be given to cows, they should be steamed; those who venture to give them raw and mashed, should allow hay with them to prevent their scouring. Cabbages may be given moderately, but turnips make thin milk, and bad butter. The miserable practice of giving oil cake to cows, insures greasy, unsubstantial, ill-scented butter; and has a similar effect on veal. When substantial food appears necessary, a daily moderate feed of Indian meal or oats, moistened with water, is most proper.

Mr. Chabert, the director of veterinary schools of Alfort, had a number of cows, which yielded very great quantities of milk. In his publications on the subject he observed, that cows fed in Winter on dry substances, give less milk than those which are kept on a green diet, and also that their milk loses much of its

quality. He published the following receipt, by the use of which his cows afforded him an equal quantity and quality of milk, during the Winter as during the Summer: Take a bushel of potatoes, break them while raw, place them in a barrel standing up, putting successively a layer of potatoes and a layer of bran, and a small quantity of yeast in the middle of the mass, which is to be left thus to ferment during a whole week, and when the vinous taste has pervaded the whole mixture, it is then given to the cows, who eat it greedily.

Pure water is an essential article for cows. Dr. Anderson says, he knew a man who acquired great wealth by attending to things of this nature, and one of his principal discoveries was the importance of having a continued supply of the purest water that could be obtained for his cows, and he would on no account permit a single animal to set a foot into it, nor allow it to be tainted even by the breath of animals.

Milch cows should never be exposed by night to the inclemency of the Winter season, which chills them and dries up part of their milk, keeping them backward in all beneficial respects. At any rate they should have a well littered shed, in which they may repose in comfort, and with their loins dry—a matter of great consequence to their health.

Those who would make the utmost advantage from cows, either as calf-sucklers, dairy-men, or milk-sellers, should always provide a bull to run in the herd, to obviate the perpetual trouble of driving them to the bull, and in order to prevent the loss and inconvenience of their becoming frequently barren. One bull will generally be sufficient for twenty cows. These animals are in their prime at two years old, and should never be suffered to continue later in a state of virility than to the fifth year, as after that time, bulls which before were gentle and lay quiet in the cow pastures, are mostly apt to contract vicious dispositions, and become very unmanageable. Whenever this happens they should be immediately castrated.

The annual consumption of food, per cow, of grass and hay, if turned to grass, is from one acre to an acre and a half of pasture in the Summer, and from a ton to a ton and a half of hay in the Winter. A cow may be allowed two pecks of carrots per day. The grass being cut and carried will economise it full one-third.

The annual product of a good dairy cow,—during several months after calving, and either Summer or Winter, if duly fed and kept in the latter season, she will render an average of seven pounds of butter per week, from five to three gallons of milk per day. Afterwards a weekly average of three or four pounds of butter from barely half the quantity of milk.

Milking.—Every precaution ought to be taken in the choice

of milkers. When this manual work is roughly performed, it becomes painful to the cow; but if a soft hand be gently applied, the animal seems rather to receive pleasure, and allows the milk to flow plentifully, as she possesses the singular faculty of retaining or parting with her milk. Indeed instances have frequently occurred, in which one dairymaid could not obtain a single drop, but another drew the milk in abundance without the least difficulty. For the same reason, when the cows are *ticklish* (as the farmers say), they should be treated with the most soothing gentleness, and never with harshness or severity. If the udder be hard and painful, it should be tenderly fomented with lukewarm water, and gently rubbed, in order to bring the creature into a good temper. Thus she will suffer the milk to flow without restraint, whereas if she retain and not allow it to be drawn off freely, it will prevent her from yielding the accumulated quantity, and eventually dry up her udder.

The business of the dairy requires close attention. The milkings, in order to be most profitable, should be made three times a day; the first at day-light; the second at noon; and the latter at twilight. This will very considerably increase the quantity of milk given in the day from any number of cows. Dr. Anderson says, that if cows were full fed, they will half give as much again when milked three times, as when milked only twice a day. At the same time this prevents too great a distension of their bags, to which the best cows are liable. When milked only twice, this should be morning and evening, regularly at the same hours.

Operation of Milking.—The operation of milking is performed differently in different places. In some, the dairy-maid dips her hand into a little milk, and by successively stripping the teat between her thumb and fingers, unloads the udder. This plan, however, is attended with the disadvantage of irritating more or less the teat, and rendering it liable to cracks and chaps, which are followed by inflammation extending to the rest of the quarter. This accounts for the disease occurring more frequently among the cows under the charge of one milker, than it does in those which are under the charge of another, and as the practice is more common in some places than in others, it also accounts for the disease being more common in those places. This plan of milking, where the irritation is not sufficient to excite the extent of inflammation to which I have alluded, frequently produces a horny thickening of the teat, a consequence of the cracks and chaps, which renders it more difficult to milk than when in its natural state; and at the same time predisposes to inflammation when any cause occurs to set it up. These effects may be, and are almost entirely avoided, by the more scientific plan of milking adopted in other places, where, instead of drawing down or

stripping the teat between the thumb and fingers, the dairymaid follows more closely the principles which instinct has taught the calf. (The calf jerks his nose into the udder and forces down the milk). She first takes a slight hold of the teat with her hand, by which she merely encircles it; then lifts her hand up so as to press the body of the udder upwards, by which the milk escapes into the teat; or, if (as is generally the case when some hours have elapsed between milking times), the teat is full, she grasps the teat close to its origin between her thumb and fore-finger, so as to prevent the milk which is in the teat from escaping upwards, then making the rest of the fingers to close from above, downwards in succession, forces down what milk may be contained in the teat through the opening of it. The hand is again pressed up and closed as before, and thus, by repeating this action, the udder is completely emptied without that coarse tugging and tearing of the teat which is so apt to produce disease.

WORKING OF OXEN.—Much difference of opinion, says the author of the Enc. of Agr., formerly prevailed as to which of the two animals, the horse or the ox, should be preferred for the purpose of farm labour; and the preference has generally been given by speculative writers to the ox, and by practical farmers to the horse. The first objection to oxen is, that they are unfit for the various labours of modern husbandry, for travelling on hard roads in particular, for all distant carriages, and generally for every kind of work which requires despatch. Another is, that an ox team capable of performing the work of two horses, even such kind of work as they can perform, consumes the produce of considerably more land than the horses. And as to the money price of the horse and ox, this, it is evident, is merely a temporary and incidental circumstance, which depends upon the demand.

Notwithstanding the judgment thus pronounced on this subject, we find in this country the practice and experience of many farmers to be directly at variance with it. In a communication of the Hon. Levi Lincoln, of Mass. to the Secretary of the Pennsylvania Agricultural Society, he says: "You inquire the mode of *breaking*, *feeding*, and *working* our oxen.

"The best broken oxen are those which are early trained, and accustomed to the yoke with occasional light work. They are often broken at as early as one or two years of age, with gentle and patient usage. At this period they are more docile and tractable, and it is thought become more powerful by being sooner accustomed to each other, and to the application of their strength to the draught. I believe they may be taught to travel in almost any gait; certain it is, the rate at which oxen differently broken will walk with their load, would seem incredible to a person igno-

rant of the difference in the mode of their training. To accustom them to a quick pace, they should at first be driven to the yoke, while young, without any or with a very light weight, and never heavily loaded until they have arrived at full strength and maturity.

"A great fault with many people is, too much indifference to the *construction of the yoke.* Almost any shapeless piece of wood, with holes for the insertion of the bows, is made to answer; but to the ease of the draught, the adaptation of the yoke or bow to the neck of the bullock, and the position of the staple and ring in the yoke, are altogether material. For common use and for ploughing, I have found that yokes are generally too short. Cattle of the largest size require a yoke from four and a half to five feet in length. In short yokes they are apt to *haul*, as it is termed, that is, draw from each other, and to such a degree in some instances, as to cross their fore legs, and destroy their power and greatly impede their progress. I once owned a pair, made totally useless by this habit, and afterwards entirely corrected it by the application of a yoke of eighteen inches more length. A short yoke is necessary only in snow paths, where cattle would otherwise *crowd* againt each other, the opposite of *hauling*, but of the same mischievous effect.

"In respect to what oxen may be made to do in a short time, or as an experiment on their strength, I must refer you to the results of our ploughing matches and trials of strength. With us they are but little used on the road, except in the transportation of heavy loads for short distances in the same town, or between neighbouring towns. One reason why horses are preferred for wagoning on the road, may be, that they can be made to travel quicker, and that from the construction of the hoof they are less liable to lameness than the cloven-footed ox, or by becoming foot sore. On the other hand, the patient and steady labour of the ox finds no substitute in the horse for the labour of the farm, and the latter is seldom seen there, except in occasional aid of the ox team, or with the light plough betwen the rows of corn.

"The value of a yoke of oxen or a pair of horses for use in all the work of a farm, admits of no comparison. So decided is the preference for the former, that I do not believe a single farmer can be found in this extensive agricultural country, who performs his labour by horses, without oxen; while there are *hundreds*, I had almost said *thousands*, who make no other use of horses in husbandry, than to furrow for planting, and plough among their corn for hoeing.

"Our oxen, also, to answer part of your inquiries, are kept in a cheaper and less expensive manner than horses. In the Summer they are uniformly grazed in the pastures. In the cold and

Winter seasons, they are put into the barns, and fed upon *stock* hay, as it is called, that which grows in meadows, and upon the fodder of corn stalks, husks, &c., unless, indeed, they are more severely worked than usual, when hay of better quality is given them; and in all cases as the Spring advances, their keeping is improved, and with better hay some grain is added. I speak of the general practice of farmers. There are some who keep their oxen more generously, and others more hardly than I have mentioned. But with a clean and warm stable, the daily application of the curry comb or card, and coarse food, without severe labour, the best farms will at all times exhibit teams of most vigorous and powerful cattle, and their best hay and their grain will be saved in their beef and pork, and in the produce of their dairies for the market.

"Oxen yoked to a cart are greatly superior to horses attached to a wagon. The greater weight which may be carried by the former, and the facility with which it is removed, by *tipping up*, are of most striking advantage in the ordinary business of a farm. It is said that a cord of green oak or hickory wood is not an unusual load for a yoke of oxen to carry upon a cart, while it would certainly require the power of three horses on a wagon. The estimate of relative expenses of keeping a pair of horses and of oxen, is in the proportion of three for the former, and two for the latter, and to this is to be added the value of the ox for beef when their strength fails for labour."

Training.—Oxen may be trained to the draught, by putting a broad strap round their necks, and fastening one end to a large log of wood; permit the ox to drag it about as he feeds in his pasture before he is put in harness, and his docility will be much forwarded.

Besides learning to draw forward, oxen should be taught how to back. When they are well broken to the draught, let them be placed with the cart where the land is descending in a small degree. In this situation they will soon learn with care to back it. Let them then be placed on level ground, and exercised there. After this they may be learnt to back up ground a little rising. Thus far there must be no load in the cart. When they have learnt to stand up to the tongue as they ought, and back an empty cart, a small weight may be put into it, or they may be taken where the land rises faster, which will answer the same purpose. Thus in a few days, they can be learned to back well and know how to do it, which by a little use afterwards they will never forget. This may appear of little consequence to some, but when it is remembered how frequently we want to back a load when we are at work with our cattle, and how commodious it is to have them back well, why should we not learn them for the time when

we want them to lay out their strength. Besides, it saves the animals many hard blows, and much vexation to the teamster. Oxen cannot be considered well broken, until they will back with ease; and their value is thereby greatly increased.

If they have contracted the habit of pushing or hauling against each other, let them be turned out to feed in the yoke, and they will learn to move in concert.

Farm Accommodations for Cattle.—Farmers differ so much in their opinions, situations, pursuits, resources, &c., that it is quite impossible to lay down any general plan with regard to the arrangement of accommodations for their stock.

In Pennsylvania there is a laudable emulation among the farmers in building good barns, which accommodates their stock comfortably. In them they stow away hay and grain. When the wheat is thrashed out, the straw is replaced ready to litter the stable and feed the cattle. The provender is so convenient that a boy can feed the stock of a considerable farm in half an hour, without going out of doors; and as all the hay and straw is in one place, consequently all the manure, without much attention, centres in one body, and is by that means preserved, as they have mostly a cow-yard with a fountain of water in it; in this the manure is kept, and the cattle run during the day to get water.

These barns are so constructed that the lower story holds all the stock, and frequently have granaries and carriage-houses, with room for all the hay, wheat, &c., produced on one or two hundred acres. This building is much more convenient, costs less, takes less room, and the business is more easily conducted, than by building corn-house, stable, carriage house, hay and straw sheds, all separate, as some of our farmers do, requiring four times the roof, which is the most costly part of the building, some of which are frequently of a temporary character, and are often a disgrace to a handsome farm; whereas the barn is a convenient, substantial, cheap building, considering the accommodation it affords.

Robert Smith, Esq., of Baltimore, give the following account of his dairy farm arrangements.

"The barn is constructed according to the best Pennsylvania models. The yard is to the south of it. On the east and west sides are cow stables containing 110 well-made stalls, and well ventilated by a sufficient number of windows and double doors. In these stables are in Summer, as well as in Winter, several ranges of cattle, duly littered and properly secured each by a chain and halter. At the tails of each range of cows, there is a drain made of strong planks, so fixed as to receive all their dung

and urine. These several drains have a sufficient declivity to carry all the fluid matter to their southern terminations, where they intersect similar drains which convey all this liquid manure into a cistern fifty feet long. This cistern is so placed and constructed as to receive not only the urine of the stables, but also the liquid matter of the farm yard. In it there is a pump, by means of which its contents are pumped into a large hogshead, fixed on a pair of wheels drawn by oxen. To the end of this hogshead is attached a box pierced with holes, into which this liquid manure flows through a spigot and faucet, and is then sprinkled over the ground as the oxen move forward.

"For the purpose of augmenting the quantity and improving the quality of the food of my stock of every kind, I have established a steam apparatus. It consists of a boiler and two wooden boxes, in which boxes is steamed the food. These boxes contain each eighty bushels. By this simple apparatus every species of coarse vegetable offal is converted into nourishing food, and all the ordinary provender is rendered more nutritious."

The common cattle stalls of our country, says Col. Pickering, are so ill contrived and so straightened in their dimensions, that the cattle are constrained to lie down in part in their own dung. This dries and forms a thick coat on their hind quarters, from which they are not relieved till they shed their hair in the Spring. They are thus rendered *uncomfortable.* To be uncomfortable is to suffer some degree of pain; and no one will suppose that animals in *pain* can *thrive*, or preserve their plight with the same food, equally with others perfectly at ease.

The practice of stacking hay and fodder in the fields, and feeding the cattle round the stacks and fodder houses, cannot be too much condemned. The disadvantages of which are, a wasteful use of the provender; the dung lying as it is dropped, without straw or any other vegetable substance brought to it, the manure is little in quantity, and that not lying in heaps, is reduced abundantly by *exhalation* and *rain*, without leaving any thing to the soil.

In good husbandry, cattle are carefully housed, or otherwise confined to a foal yard in which are *shelters* against cold rains, during the Winter and as far through the Spring as food will last; by this means there is a fair expenditure of provender, *without waste*, less exhaustion of the juices, because of the dung lying together in large heaps; and the dung being mixed with the straw and other vegetable substances brought to the beasts as litter, the whole is trod together and forms a large quantity of very valuable manure.

Litter is as essential to cattle, when let into yards, as when placed in stalls under cover, without which yard manure is of

small account; and unless it be in full proportion to the number of cattle in the yard, it is not thought highly of, but is a half done thing. Good farmers in England deem full littering of cattle, when in yards, of such importance, that after reaping with sickles, and in-ning their wheat, they cut the stubble and stack it for litter. Besides straw and stubble for litter, they apply to the same use fern, and such other vegetable substances as they can procure; and they buy straw from common farmers who are not in the practice of littering. In all countries common farmers are indifferent to improvements; they work not beyond old habits; and it is prudent that they venture not on extensive new projects, without first making experiments. A full littering is three loads of 12 or 1300 lbs. of straw to each grown beast. Corn stalks may be carried from the field in great quantities, in a skeleton frame cart, if not cut up and fed when fresh.

Many farmers feed in their yards in racks, and suppose that they gain every possible advantage from the practice, by the saving of the dung dropped, trampled, and watered by the cattle; and though this practice is certainly preferable to wasteful pasturing, or to feeding in the fields, yet it ought to be *recollected* that the manure will be much inferior to that made and preserved under cover.

Where cattle are yard fed, or stall fed in yards under sheds, it is of great consequence to defend the beasts against the cold and damp north-east winds, and the cold blasts from the north-west. Mr. E. Duffield, therefore, advised a friend who wished to have a complete farm yard, to erect a range of buildings in a south-east direction, to have double stalls below, leaving the south-west and south-east sides open to admit the sun in the Winter, and give free entrance to the prevalent winds in the Summer.

CHAPTER VI.

DISEASES OF CATTLE.

DISEASES OF THE HEAD, MOUTH, AND NOSTRILS.—Nature has given to most species of cattle a formidable weapon of offence, the horn. To be effective it must be securely based; and it could be so, or it could be best so, by the expanse of the frontal bone. From this bone the horn springs, and it is in fact a continuation of the frontal.

Young bullocks will often make too early use of their horns, and many are the desperate encounters before it is determined who is the master of the field. In this way the horn gets occasionally fractured. If the bone of the horn is evidently broken. but the external covering is not displaced, nothing more is necessary than to fit some splents to the part, and bind the whole well up, so that the fractured edges shall be kept securely in opposition to each other, and in a fortnight or three weeks all will be well.

Sometimes the horny covering is torn off. If the bone is not fractured, it will be best to leave the process to nature. Young beasts are particularly subject to this loss of the covering of the bone, from their violent contests with each other. There will be a great deal of hemorrhage at first, but this at length ceases, and leaves the bone covered with coagulated blood. This by degree hardens, and forms a temporary case for the bone, and the horny covering is re-produced.

The Ears of animals are comparatively exempt from disease. The passage into the ear is more tortuous and better guarded with hair than the horse, and no brutal ignorant fellow sets to work to burn that hair. The inconveniences which arise from the introduction of insects into the ear seldom occur. These organs, however, are much exposed to contusions, producing swellings, abscess, and deafness. Fomentations will afford the principal means of relief or cure, with occasional washing out the ear with warm water or soap and water, with the application of a weak solution of alum when inflammation has subsided.

The Eye.—The ox is oftener wounded in the eye than the

horse, whether by the horn of his fellows, or the prong of his attendant. He is also subject to bony tumours about the eyes or on the edge of the orbit. They generally appear on some part of the external division of the orbit. They increase with greater or less rapidity, and they take a direction which may or may not interfere with vision ; and occasionally they bend towards the eye and press upon it, and are sources of torture and blindness. If the tumour is on the upper part of the orbit, and appears to be attached by a kind of pedicle, it may be sawn off and the root touched with the cautery; in other situations we shall generally be confined to the use, and often the ineffectual use, of external stimulants. The best is the cautery. An iron is to be prepared, somewhat hollowed and rather larger than accurately to contain the tumour in its hollow. A piece of bacon rind with a little of the fat attached to it is then to be cut to the shape of the tumour, and so as to cover it, and being placed over it, the iron heated nearly red hot is to be applied upon it, and firmly held there for the space of two or three minutes, and afterwards more lightly applied until the rind is dried or burned. This may be repeated two or three times, with intervals of two or three days. Should the tumour not diminish, nothing more can be done ; for these bony growths in cattle, arising from local injury, have very little life in them, and soon degenerate into a state of caries.

Cattle are very subject to particular eruptions on the edges of the eye-lids, accompanied sometimes by great soreness and considerable ulceration. It bids defiance to every application, except the mild nitrated ointment of mercury, and occasionally it does not yield even to that ; yet, on the approach of Winter, it frequently disappears spontaneously. It indicates a foul habit of body, and is often connected with mange ; and unless proper means are taken, it will assuredly return in the following Spring. Purges of sulphur will be found useful ; but if the animal is so fond of a mash as not to refuse one with a powder in it, a course of alterative medicine will be most serviceable. The powder should consist of one part of Æthiop's mineral, two of nitre, and four of sulphur, and an ounce every night, according to the age and size of the beast.

Worts on the eyelids are best removed by the scissors,—the root being afterwards touched with the nitrate of silver.

There is a singular disease of the eye that cannot properly be called opthalmia, but which sadly frightens the owner when it first appears. Young cattle pasturing on wet and woody ground are suddenly seized with swellings of the tongue and throat, and eruptions about the membrane of the mouth. At the same time the eyes become intensely inflamed, and superficial ulcers appear

or the cornea. This is only one of nature's methods, a rather singular one, of getting rid of something that offended the constitution; and the wisest plan is to let it pretty nearly alone. The part may be fomented with warm water, or, if the eyes are closed, perhaps an evaporating lotion of cold water, with a little spirit, and possibly a little gentle physic.

Tumours in the brain.—The sheep is subject to a disease strangely termed turnsick, in which the animal goes round and round in the same way as the cow with fractured skull. The cause of this has been traced to an animalculæ, called an hydatid, pressing upon the brain; and for which, of course, there is no cure.

The cow will sometimes exhibit the same symptoms; but let it not be at once ascribed to the same cause. It is evidently pressure on the brain. But is the pressure of the hydatid the only one that can affect the brain? An effusion of blood, or other fluid, would produce the same effect. Let the animal be copiously bled, and a strong dose of physic given. In some instances, perhaps we might say in a majority of cases, the animal will do well. A somewhat spare diet at the time, and for a while afterwards, will be plainly indicated.

There is another species of pressure on the brain, called water in the head. This will occasionally be a source of general disease or death. The symptoms will very much resemble those of apoplexy.

Apoplexy.—Cattle are very subject to determination of blood to the head. They are naturally plethoric. There are few premonitory symptoms in these cases. The animal is struck all at once; he falls—he breathes heavily—he struggles with greater or less violence, and then dies—sometimes in five minutes, oftener after the lapse of a few hours.

If there is time to do any thing, the beast should be bled, and as much blood should be taken away as can be got. A pound and a half of Epsom salts should be next given, and without any carminative; and this followed up with doses of half a pound, until the physic operates. Its action should afterwards be maintained by six ounce doses of sulphur every morning. The beast being restored, as he is liable to a return of the complaint, should be slaughtered.

Phrenitis.—The *phrensy* or *sough* in cattle, is too well known to the farmer and the practitioner. There is generally, at first, much oppression and heaviness; the animal can scarcely be induced to move; the eyes are protruded and red; the respiration is hurried, and delirium, more or less intense, rapidly succeeds. The beast rushes at every thing in its way; it mischievously seeks out objects; it is in incessant action, galloping

about with its tail arched, staggering, falling, and bellowing hideously.

As to the treatment of phrenitis, there is some difficulty. Is any treatment practicable? Is human life to be hazarded? Cases will occur in which a bullet would be the best remedy. If the beast can be managed, or approached, during a momentary remission of the symptoms, bleeding should be attempted; and if a vein can be opened, it should be suffered to bleed on as long as it will. Physic, if it can be given, will be indicated. Epsom salts may be given. If there is time to get down one hornfull of drink, a scruple or half a drachm of the farina of the Croton nut may be administered, mixed with a little gruel.

Tetanus, or Locked-jaw.—Tetanus is not of frequent occurrence in cattle. But it is seldom that a beast recovers from it. Its approach is very insidious, and rarely observed until the mischief is done. The animal is off its food, ceases to ruminate, is disinclined to move, and stands with its head protruded; but there is no dryness of the muscle or heat of the horn, or coldness of the ears; and nothing is done. The next day the beast is found to be in the same state; it has scarcely moved, and the owner begins to be a little alarmed. The animal is now standing straddling behind; he can scarcely be induced to alter his position; and if he is made to turn, he turns all together. The finger is put into the mouth, and it is found that the jaw is locked; a discovery which might have been made two or three days before, and when the ox might have been saved. Working cattle are most subject to the disease.

The treatment should be of the promptest character. The animal should be bled until the pulse falters, or rather until the patient blows, staggers, and threatens to fall. There is nothing so likely to relax spasms of every kind, and to have some effect even in this excessive and universal one, as bleeding almost to fainting. We have known twenty and even twenty-four pounds taken from the beast before the desired effect was produced; and these are the cases which oftenest do well, when the constitution resists the bleeding as long as it can, and then gives way.

One effect, not always so lasting as we could wish, follows the bleeding: the spasm is somewhat relaxed, and the jaws can be opened a little way. Advantage must be taken of this point, to pour in a dose of physic. That which is the most active and lies in the smallest compass, is the best here; and a half a drachm or two scruples of the farina of the Croton nut, should be given in a little gruel, if it can be then administered, or as soon as it can, a pound or a pound and a half of Epsom salts, in solution. This must be followed up until the bowels are well

opened. All other medicine, all other means, will be thrown away, until brisk purging is produced. After the first dose of Epsom salts and Croton farina, half pound doses of the salts should be given every six hours, until the desired effect is produced; but the first day having passed, the Epsom salts may be changed with advantage for common salt. Injections should likewise be administered every third hour, and in sufficient quantities, (four or six quarts at least,) and in each of them half a pound of Epsom salts should be dissolved. If four or six doses of medicine have been given, and the animal continues to be constipated, the pulse, the ear, and the horn should be examined as to the degree of fever; and if any degree of it is indicated, or if the pulse does not plainly denote debility, a second bleeding must be resorted to, and carried on as before until the circulation is evidently affected.

If the animal still remains constipated, it is clear enough that the physic is accumulated in the paunch, and that the stomach is not disposed to act. Strong doses of aromatics and tonics must be added to the physic, in order to rouse the paunch, if possible, to the expulsion of its contents; and purging being established, an attempt must be made to allay the irritability of the nervous system by means of sedatives, and the best drug that can be administered, we should, perhaps, be warranted in saying the only effectual one, is opium. The crude opium dissolved in warm water, and suspended by means of mucilage of gum, and the yolk of an egg, will be the preferable form in which to give it. The dose should be a drachm three times a day, and increased to a drachm and a half on the third day, if the effect of the smaller dose is not evident.

A seton of black helebore root in the dewlap, may be of service.

Epilepsy.—This is a disease of rare occurrence, but one not easy to treat when it does appear. There are few symptoms to indicate the appearance of the fit, except, perhaps, a little dulness or heaviness, which precedes every other disease, or which might be merely accidental, or the result of very trifling indisposition. All at once the beast begins to stagger—he falls; sometimes he utters the most frightful bellowings, at other times he makes no noise, but every limb is convulsed; the heaving at the flanks is particularly violent. The fæces and the urine flow involuntarily. Sometimes these symptoms do not continue more than a few seconds; at other times the fits last several minutes, and then the convulsions become less violent.

A very serious part of this business is, that the *habit* of fits is soon formed. The first is frequently succeeded by a second, and at length three or four will occur in the course of a day.

Bleeding, physic, and short commons, will comprise the treatment here, and the last is the most important of all.

Palsy.—Palsy is usually slow in its progress. There appears to be a general debility, perhaps referable to the part about to be attacked, more than to any other; and it will be afterwards recollected that there was a giving way or troubling of that part, and sometimes, but not always, a coldness of it. The hind limbs are the parts which are most frequently attacked.

The most frequent cause of palsy is the turning out of beasts of any kind, but particularly of cows, too early to grass, after they have been housed during the Winter and first part of the Spring. We have known one-fourth of the stock completely chilled and palsied behind, in the course of two or three nights.

The treatment of this disease would be half summed up in one word—*comfort*. The cattle should, if possible, be immediately removed into a warm, but not close, cow-house, and well littered up, and perhaps a rug thrown over them. If this is done, and they are turned twice in the day, and so laid that the fæces and urine will flow from them, they will be much better than in slings.

Physic should be the first thing administered. This species of palsy is usually attended by considerable constipation, *which must be overcome*; but with the physic a good dose of cordial medicine should always be mixed. We would give an ounce of powdered ginger, and we would crown the whole with a half pint, at least, of good sound ale.

The patient does not quite refuse to eat in palsy, but there is usually an indifference to food. This is another reason for giving a little cordial with the physic. The beast should be coaxed to eat; the food which is in season should be offered to it, and frequently changed.

The chief dependence is on keeping the bowels open and the animal comfortable; and then in a varied period from ten days to a month, he will usually get up again.

Rabies.—There is one more disease of the nervous system, the most fearful of the list, viz. *Rabies*. When a rabid or mad dog is wandering about labouring under an irrepressible disposition to bite, he seeks out, first of all, his own species; he travels out of his road to attack them; but if his road lies by a herd of cattle, he will attack the nearest to him, and if he meets with much resistance he will set upon the whole herd, and bite as many of them as he can.

When there is any suspicion that a beast has been bitten, the wound should be carefully searched for. If any one was by when the attack was made, he probably will be able to point out the limb that was most in danger, or that was actually seized.

The wound being discovered the hair must be cut off from the edges of it, and the lunar caustic, (nitrate of silver,) the stick being reduced to a point, introduced into it, and brought in contact with, and made thoroughly to act upon, every part of it. If there is any doubt about the probability of the caustic coming into contact with every part of the wound, it must be enlarged with the knife, so as to give free access to the substance applied. This is the only preventive; and the caustic being freely used upon the whole of the wound, the beast is safe. But who, on an animal thickly covered with hair, will venture to say that there is no other wound? It so unfortunately happens, that the slightest scratch, neglected, is as dangerous as a lacerated wound.

In this state of uncertainty, therefore, the farmer must look out for the worst. If the disease is to appear at all, it will be about the expiration of the fifth week, although there will be no absolute security in less than double that number of months.

Coryza.—By this term is meant inflammation of and defluxion from the nasal cavity, or the cells with which it is connected; when the same affection extends to the fæces, it becomes catarrh.

It is a matter of the utmost importance for the proprietor of, or the attendant upon, cattle, to assure himself that it is simple coryza. He should carefully examine whether there is any cough, especially whether that cough is painful; any increased labour of breathing; any diminution of appetite; suspension of rumination; fever. The pulse felt at the left side, and the temperature of the root of the horn, will best ascertain this last particular.

If there is nothing of these, still we have inflammation, and of a character that soon connects itself with some or all of them, therefore a mash may be given in the evening, and a few doses of cooling medicine.

The best fever medicine for cattle is nearly the same as that recommended for the horse, but in doses of only half the quantity. Half a drachm each of powdered digitalis and emetic tartar, and two drachms each of nitre and sulphur, will constitute the medicine fever powder to be given as occasion may require, and increased or diminished in quantity according to the size and age of the beast, and the intensity of the disease. This should be given in the form of drink. If it is well ascertained to be simple coryza, there may be added half a drachm of sulphate of copper (blue vitriol,) finely powdered, to the other ingredients.

Glanders—Farcy.—It is fully established that cattle are not subject to either of these diseases.

Blain, or inflammation of the tongue.—There is a disease of

the tongue in cattle, which from its sudden attack, its fearful progress, and frequently fatal termination, requires particular notice. The animal is dull, refuses his food, and rumination ceases. A discharge of saliva appears from the mouth; it is at first limpid and inoffensive, but soon becomes purulent, bloody, and exceedingly fœtid; the head and neck begin to swell, and become enormously enlarged; the respiratory passages are obstructed; the animal breathes with the greatest difficulty, and is in some cases literally suffocated. This is the *Blain, or inflammation of the tongue.*

The treatment of blain is very simple; and if adopted in the early period of the disease, effectual in a great majority of cases. It is at first a local malady, and the first and most important means to be adopted will be of a local character. It is inflammation of the membrane of the mouth, along the side of and under the tongue, and characterized by the appearance of vesicles or bladders, perhaps pellucid at first, but becoming red or livid, as the disease advances. *These vesicles must be freely lanced from end to end.*

Some rub a little salt into the incision as soon as it is made, and others apply a solution of alum. Either may be done, and the first is preferable, if the owner wishes that something of the kind should be attempted; but neither of them is necessary. If the disease has made considerable progress, and the vesicles begin to have a livid appearance, or perhaps some of them have broken and the smell is becoming very offensive, the mouth must be carefully examined, and any vesicle still remaining whole, or new ones beginning to rise, must be deeply and effectually lanced, and the ulcers washed half a dozen times in the day, or oftener, with a diluted solution of chloride of lime, (a drachm of the powder to a pint of water). By means of a syringe or piece of sponge, this may be brought into contact with every part of the ulcerated surface.

In a very short time the unpleasant smell will diminish or cease, and the ulcers will begin to assume a more wholesome character. When all fœtor is removed, the mouth should be bathed with a lotion composed of equal parts of tincture of myrrh and water, or a pretty strong solution of alum, to which a fourth part of the tincture of catechu has been added.

Thrush in the mouth.—There is a disease, sometimes an epidemic, and especially in the Spring and Winter, when the weather is unusually cold and wet, that may be mistaken, and we believe has been so, for blain. It consists in the appearance of pustules, or sometimes vesicles, not merely along the side and at the foot of the tongue, but all over the mouth, and occasionally even on the outside of the lips. These pustules break, and mi-

nute ulcers succeed, and may run a little into each other; but they oftener speedily heal.

This is a very harmless affair. There is sometimes a slight degree of fever, but rarely such as to interfere with the appetite, and never such as to indicate danger. The disease may last for ten days or a fortnight, or more, but it gradually yields to a few mild doses of physic; and we have thought that the beast throve better afterwards, for having got rid of something that was oppressive to the constitution.

Inflammation of the parotid glands.—The parotid gland in cattle, (the gland in the neighbourhood of the ear), is very subject to inflammation. Contusions, or wounds of the part, are frequent causes of inflammation, and this gland in the ox sympathises strongly with the catarrhal affections of the upper air passages. A bullock will rarely have hoose accompanied by any degree of fever, without some enlargement and tenderness of the parotid. There is scarcely an epidemic among cattle, one of the earliest symptoms of which is not swelling of the head and neck. These swellings under the ear are guides, on which we place much, and perhaps the greatest dependence, in judging of the intensity and danger of the disease; and particularly and most of all to be dreaded, is tendency to assume a typhus form. These enlargements have been confounded with the strangles; but this has been through want of proper examination of the parts.

Inflammation of the parotid gland is accompanied by heat and tenderness of the part, and which renders the beast unwilling to eat or to ruminate; and sometimes by so much swelling as to threaten immediate suffocation.

This inflammation is to be combated like others, by fomentations, cataplasms, and occasionally blisters in the early stage; bleeding and physicking must be resorted to, according to the degree of general fever. When an abscess is formed it should be freely lanced. The ulcer must be washed with the chloride of lime to arrest the progress of gangrene, and the tincture of aloes to heal the part after the bursting of the abscess. Mild purgatives will be very useful, each of them containing aromatic or tonic medicine.

Bleeding.—The jugular vein is by common consent adopted as the usual place for bleeding cattle. The vessel is easily got at, it is large, and can scarcely be missed by the clumsiest operator. The strap round the neck, in order to raise the vein, should be dispensed with. It presses equally on both sides of the neck, and we have more than once seen consequences that for a little while bore an alarming appearance, produced by this sudden stoppage of the return of so much of the blood from the vein. If

the vein is pressed upon by the finger a little below the intended bleeding place, it will, as in the horse, become sufficiently prominent to guide any one who should be entrusted with the bleeding of a beast.

The instrument of the veterinary surgeon should be the lancet, but one considerably broader shouldered than he uses for the horse. A larger vessel will bear a proportionably larger orifice; and the good effect of bleeding depends more on the rapidity with which the blood is abstracted, than on the quantity drawn. The owner of cattle will do better to confine himself to the old blood-stick and fleam, for the hide of the ox is so much thicker than that of the horse, and the edge of the lancet is so apt to turn, that it requires a little experience and tact to bleed with certainty and safety.

In the abstraction of blood from the ox, and especially at the commencement of a disease, or while inflammation runs high, the rule is the same as in the horse, *viz:* To let the blood flow until the pulse plainly indicates that the circulation is affected. All other bleeding is worse than useless—it is sapping the strength of the constitution, and leaving the power of the enemy unimpaired.

We have seen as bad necks in cattle, after bleeding, as in the horse. They must be treated in the same way, by fomentations and emollient lotions at first, and when these fail, the application of heated iron to the lips of the wound; or in very bad cases, the introduction of setons, or the injection of zinc-wash into the wound.

The Pulse.—The blood is carried through the arteries by the force of the heart. These are composed of three coats; the outer or elastic, by which they yield to the gush of blood; the muscular coat, by which the artery contracts again, when the gush has passed; and the inner or smooth glistening coat, which lessens the friction of the blood against the side of the vessel, and its consequent gradual retardation in its course.

The muscular coat of the artery can be felt giving way to the gush of blood; and the expansion of the artery as the blood passes, is called *the pulse.* Every one who knows the least about cattle, is sensible of the importance of the indications to be obtained by the pulse. The heat of the blood may be felt at the root of the horn, and the rallying of the blood around some important but inflamed part, may be guessed at by means of the coldness of the ear or the extremities; but here we ascertain the state of the general system, and the increased force or debility of the central machine on which every secretion and every function depends. The pulse is not so easily felt at the jaw of the ox. The temporal artery will generally be sufficiently distinct; but on the whole

it will be most convenient to ascertain the beating of the heart itself, by placing the hand on the left side, a little within and behind the elbow. The average pulse of a full-grown healthy ox, is about forty.

DISEASES OF THE CHEST. *Inflammation of the pericardium.*—(the membrane which incloses the heart).—This is occasionally the seat of obscure, unsuspected, and fatal disease. The cow is a greedy animal—she will swallow almost every thing that comes in her way. She will pick up large pins and needles, and especially if the latter should have any thread attached to them. We are strongly inclined to believe that these diseases occur oftener than has been suspected; and it is an unfortunate circumstance, that these pointed substances, which in other animals take very different paths, but generally comparatively harmless ones, in order to work their way out of the body, should here select this dangerous and fatal course. The proprietors of cattle, and of cows particularly—for the cow chiefly, or almost alone, has this strange propensity,—will be a little more careful as to the manner of feeding them.

The heart is subject to inflammation, but not so often as in the horse. It would be principally recognised by the strength of the pulse, and by the bounding action of the heart, evident enough when the hand is placed on the side of the chest, and which may be seen and heard even at a distance.

Inflammatory fever.—Cattle of all descriptions and ages are occasionally subject to inflammatory fever; but young stock, and those that are thriving most rapidly, are its chief victims.

There are few premonitory symptoms of inflammatory fever. Often without any, and generally with very slight indications of previous illness, the animal is found with his neck extended; his head brought as much as he can effect it, into a horizontal position; the eyes protruding and red; the muzzle dry: the nostrils expanded; the breath hot; the root of the horn considerably so; the pulse full, hard, and from sixty-five to seventy; the breathing quickened and laborious; the flanks violently heaving, and the animals moaning in a low and peculiar way.

The subsequent stages of this disease are *quarter evil—joint murrain*, (when the animal becomes lame), and *black quarter*, when a gangrenous sloughing process has commenced with all its fearful characters.

The very name of the disease, *inflammatory fever*, indicates the mode of treatment. In case of excessive vascular action, the first and most important step is copious bleeding. As much blood will be taken as the animal will bear to lose; and the stream will flow on until the beast staggers or threatens to fall. Here,

more than in any other disease; there must be no foolish direction about quantities. *As much blood must be taken away as can be got* ; for it is only by a persevering use of depletory measures, that a malady can be subdued that runs its course so rapidly.

Purging must immediately follow. The Epsom salts are here, as in most inflammatory diseases, the best purgative. A pound and a half dissolved in water or gruel, and poured down the throat as gently as possible, should be the first dose; and no aromatic should accompany it. If this does not operate in the course of six hours, the patient should be carefully examined. Is there any amendment? Is the pulse slower, softer? If not, he must be bled a second time, and until the circulation is once more affected. If the animal is somewhat better, yet not to the extent that could be wished, it would be warrantable to bleed again, provided the sinking and the fluttering of the pulse does not indicate the commencement of debility.

If the pulse is a little quieted, and purging has taken place, and the animal is somewhat more himself, the treatment should be followed up by the diligent exhibition of sedative medicines. A drachm and a half of digitalis, and one drachm of emetic tartar, and half an ounce of nitre, should be given three times a day, and setons inserted in the dewlap. Those of black helebore root are the best, as producing the quickest and the most extensive inflammation.

If the animal is not seen until the inflammatory stage of fever is nearly passed, the skill of the practitioner will be put to the test, and yet he will not find much difficulty in deciding how to act. If the animal has not been bled, nothing but palpable debility should prevent it. Physic will also be indispensible, but double the usual quantity of aromatic should be added, in order to stimulate the rumen, if the drink should get into it. A pound of Epsom salts at first, and half pound doses afterwards, until the bowels are opened, will be sufficient in this stage; and if after the fourth dose (injections having been given in the mean time), purging is not produced, the quantity of the aromatic, but not of the purgative, may be increased.

If ulcers have broken out, and the sloughing process have commenced, there must be no bleeding, but physic is necessary, with a double dose of the aromatic, in order to rouse the energies of the digestive system. Epsom salts will here also constitute the best purgative. The ulcers should be carefully washed several times every day with a solution of the chloride of lime, of the strength already recommended. If the stench from the ulcers does not abate, the solution of the chloride should be increased to a double strength. But as soon as the fœtor has ceased, and

the wounds begin to have a healthy appearance, the healing ointment, or the tincture of aloes, may be adopted, and the latter is preferable. A seton or rowel should be retained for three or four weeks: but the medicine discontinued as soon as the animal is on its legs.

Typhus Fever.—This is fever of a low, chronic, typhorid form. It sometimes follows intense inflammatory action; and then it may be considered as the second stage of that which has just been considered; but often there have been no previous symptoms of peculiar intensity, at least none have been observed, but a little increased heat of the ears, horns, and mouth; a pulse of sixty or seventy, a certain degree of dullness; a deficiency of appetite, and occasional suspension of rumination; a disinclination to move; a gait approaching to staggering; and a gradual wasting. As soon as it becomes established, a diarrhœa succeeds; and this is either produced by small doses of physic, or it comes on spontaneously It is not, however, violent, but continues from day to day.

Bleeding is the first step, and that until the character of the pulse begins to fail. Physic will naturally follow, but with some caution; for it has been already stated, that there is a natural tendency to diarrhœa connected with this disease, which it is difficult and sometimes troublesome to subdue. One dose of Epsom salts should be given, with the usual quantity of aromatic medicine. But the action of this medicine should be secured and kept up by half-pound doses of sulphur, administered as circumstances may indicate.

To this will follow sedatives,—digitalis, emetic tartar, and nitre. But these should not be given until the fever is subdued,

When tumours and ulcerations appear, they are to be treated as before recommended.

Catarrh or Hoose.—It is not intended to inculcate a system of over nursing, but the farmer should be aware of every beast that coughs. It may only be a slight cold, and in a few days may disappear of itself; but these few days having passed, and the cow continuing to hoose, it begins to be imperatively necessary for him to adopt the proper measures while they may be serviceable.

Let her be taken up and examined. Does she feed as well as ever? Does the dew stand upon her muzzle? Are her flanks perfectly quiet? Then one or two nights housing and a mash or two, or a dose of physic, may set all right. But if, on examination, the muzzle is a little dry, and the root of the horn hot, and she heaves (although not much) at the flanks, and the coat is not so sleek as usual, and she is a little off her food, let her be bled. Experience will teach the farmer that these chest af-

than we generally add, will be serviceable, effecting the present purpose, and not hastening or increasing the debility, which is generally at hand; but if the bowels are sufficiently open, or diarrhœa should threaten, and yet symptoms of fever should be apparent, no purgative must be given, but the sedatives should be mingled with more vegetable tonic. The peculiar fœtid diarrhœa should be met with astringents, mingled also with the vegetable tonic. In combating the pustular and sloughy gangrenous stage, the chloride of lime will be the best external application; while a little of it administered with the other medicines, inwardly, may possibly lessen the tendency to general decomposition. The external application of it should not be confined to the ulcerous parts alone, but it should be plentifully sprinkled over and about the beast; and the infected animal should be immediately removed from the sound ones.

Pharyngites—Sore Throat.—The characteristic symptoms are, disinclination to food, suspension of rumination, and difficulty in swallowing.

It is seldom that this disease is a simple affection in the horse; it is usually combined with catarrh or inflammation; it speedily terminates in them, or it is the sympathy of the pharynx with other inflamed parts; and its treatment merges in the treatment of them, except that recourse should be had to local warmth, and the application of local stimuli. In cattle, it is often a decidedly local affection. There is not the same tendency to take on inflammation in the neighbouring parts produced by ill usage or mis-management; the treatment, however, will be the same, viz. bleeding and physic, to abate the general fever; and stimulating embrocations, or even blisters, to subdue the local inflammation.

Laryngites—Inflammation of the Larynx.—This is a dreadful disease, and fortunately one of rare occurrence. It is inflammation of the lining of the larynx, and attended by a quickened, and loud, and laborious breathing, that would scarcely be thought credible.

The treatment is here plainly indicated—bleeding, physic, blisters, and, when suffocation actually threatens, tracheotomy. (Tracheotomy is forming an artificial opening in the windpipe.)

Epidemic affection of the upper air passages.—In low and marshy districts, and wet and cold ungenial Spring and Autumn, there is occasionally an epidemic inflammation of the pharynx, larynx, and windpipe, which differs in some respect from any of the diseases that have yet been described, and is very fatal. The malady commences, like most febrile ones, with loss of appetite and suspension of rumination; to those speedily succeed dulness, some prostration of strength, and a slight difficulty of

breathing. The throat becomes gorged, and sometimes there is a discharge from the mouth or nose of a purulent character; yellowish-white in colour, fœtid, and tinged with blood. The disease frequently terminates in suffocation.

Bleeding has been found of little service in this complaint; the manifest object should be, either to hasten the suppuration while the surrounding membrane and other parts retain some vital power, or to evacuate the fluid as quickly as possible. For the first purpose, blisters of various kinds, and even the heated iron, have been applied to the throat; for the second, the tumour has been lanced, however deeply it may be seated.

Bronchitis.—When the catarrh begins to spread, and to involve the lower and more important air passages, it attacks the bronchial tubes oftener than any other portion of the respiratory apparatus. That which would become inflammation of the substance of the lungs in the horse, is a similar affection of the lower and minuter air passages in cattle. Bronchitis, however, is seldom pure; it is the prevailing disease, complicated with slighter inflammation of the neighboring substance of the lungs. It is rarely sudden in its attack. It is preceded, and generally for a long time, by cough—cough becoming more and more frequent, and painful, and husky, and wheezing. Bronchitis being the intermediate step between catarrh and consumption, this is another reason why the cough should early be attended to.

The existence of bronchitis may usually be detected by a gradual change of the countenance; a sunken, anxious, haggard look; a rapid and laborious breathing, attributable, at first glance, to something more than mere catarrh, however severe that may occasionally be. There is a very considerable disinclination to move. This gives a consciousness of the danger of suffocation. The beast is hot. The animal loses flesh rapidly, and to a very great extent.

Bronchitis, when not attended with the violent symptoms that characterise the existence of worms in young cattle, should be treated like other inflammatory complaints. Bleeding will, as usual, be the first remedy, and it should be carried to the extent which the pulse will allow; in general, however, the ox will not, in this complaint, bear the loss of so much blood as in other chest affections. To this should follow physic, and the sedative medicines already recommended, with mashes, &c.

Inflammation of the Lungs.—The beautiful appearance of the *lights*, or lungs, in cattle, compared with those of the horse, will sufficiently prove that these animals are comparatively seldom subject to have inflammation of the lungs.

Pneumonia, however, or inflammation of the lungs, occasionally attacks all cattle, but more particularly working beasts, and

those that have been driven a long way, or that have been unnecessarily hurried on a journey of considerable length. The disease usually appears at the distance of some hours, or a day or two, from the exciting cause of it, and can generally be clearly traced to that cause. The beast is dull—the head is extended or drooping—grazing and rumination have ceased. The flanks heave, but not so laboriously as in bronchitis. There is cough frequent—sore, but not so frequent, nor so urgent, nor so painful, as that of bronchitis. The mouth is hot, but the horns, and ears, and feet, are cold—death cold. The animal will not lie down; he will scarcely move; but more from inability to move, because he wants the use of the muscles for other purposes, than from fear of suffocation; and he plainly and anxiously points out the seat of disease, by looking at one or both flanks.

Bleeding will be indicated, and as early as possible; and, pursuing the old rule, the blood should flow till the pulse is affected. Physic will be as plainly indicated as in bronchitis. It should be, however, of an unirritating kind. The purgative effect should be produced by Epsom salts, and kept up by sulphur. In acute inflammation, like that of the lungs, it is necessary that physic should act speedily; and yet it may amazingly accumulate in the rumen.

Blisters will here be especially indicated. It is difficult to cause blisters to rise on the thick skin of an ox; yet the common blister ointment, thoroughly rubbed in, will occasionally effect it. The turpentine tincture of cantharides, repeatedly applied, will cause considerable swelling; or, both of them failing, there remains, in bad cases, boiling water and the hot iron. Setons in the dewlap, should never be omitted.

Acute and Epidemic Pneumonia.—An acuto species of pneumonia in cattle is sometimes met with, and it occasionally appears as an epidemic. The beast hangs his head; there is dryness of the muzzle; the mouth and the breath are hot; the flanks more or less agitated; there is a hard, dry, and frequent cough; the appetite is gone, but the thirst is excessive; the excrement is solid and black, or liquid, black, and fœtid; the coat is rough; the horns and ears hot, or alternately hot and cold; there is languor, and apparent weakness; and sometimes direct lameness, and most frequently of one of the hind legs.

To these speedily succeed other symptoms, and sometimes rapidly carry off the animal, in twenty-four or forty-eight hours after the first attack. This is particularly the case with young animals, and those that are in good condition. At other times the beast hangs on six or seven days.

Of the nature of the treatment, there can be no rational doubt.

Bleeding is the sheet anchor, and should be pushed to its full extent. The important fact that the pulse, duly attended to, will prevent the possibility of injurious consequences resulting from bleeding, in any case, cannot be too often alluded to.

The state of the cough, and heat of the breath, and heaving of the flanks, will indicate whether the fever has permanently diminished, and will guide as to a second bleeding.

Physic will then succeed. Two scruples of the farina of the Croton nut should first be given, as most likely to operate speedily; and the Epsom salts and the injection pump, should be in requisition until the bowels are opened.

This being accomplished, the nature of the medicines next to be administered is to be considered. If the inflammation evidently continue, the digitalis, emetic tartar, and nitre will be given. If the fever is subdued, or considerably so, the sedative medicines must still be given, but half an ounce of the spirit of nitrous ether should be added.

If the stage of debility is evidently approaching, the chance of doing good is almost gone: still there is no cause for absolute despair. The mouth, nostrils, and suppurating tumours, must be washed with the chloride of lime. A small quantity—half a drachm—of the powder, in solution, should be given night and morning. The spirit of nitrous ether and laudanum, in doses not exceeding an ounce of the former, with half an ounce of the latter, should be administered; and to them may be added, ginger, gentian, and colombo; the whole being given in thick gruel with half a pint of good ale.

Malt mashes, vetches, carrots, clover hay—according to the season, may be offered as food; and, should the situation and time of the year permit it, the animal should be turned into a salt marsh, as soon as it has strength to travel there.

Pleurisy.—Cattle, much oftener than the horse, are subject to inflammation of the pleuræ, or covering membrane of the lung, and the lining one of the chest. Pleurisy may be produced by contusions on the side, and by wounds penetrating the thoracic cavity.

Whatever be the cause, post mortem examination proves that, next to the bronchitis, the most frequent disease of the chest, is pleurisy.

Among the symptoms by which we may distinguish pleurisy from every other inflammatory affection of the chest, is the greater frequency of universal shivering, and particularly of shivering or trembling of the shoulders. This is a very peculiar symptom, and should be carefully studied. Even while the animal is otherwise quiet, the shoulders, and upper part of the chest, are trembling violently,

39*

The cough in pleurisy is lower, shorter, and more painful than that of most other chest affections. The breathing, seldom so laborious as in some other cases, is shorter, and broken off in the act of respiration, and lengthened in that of exspiration. The sides are tender, the animal shrieks if they are but lightly touched, and there are twitchings of the skin, and a very curious succession of many lines running over the affected side or sides.

There is little difference in the treatment of pneumonia and pleurisy. In both the inflammation must be subdued by bleeding, physic, sedatives, blisters, setons, and restricted diet. Half an ounce of the common liquid turpentine may be used with advantage instead of the nitre, when the presence of pleurisy is clearly ascertained

Phthisis or Consumption.—One of the consequences of continued inflammation of the lungs, is the formation of tubercles. An animal possessing this tuberculated state of the lungs, and the tubercles running into abscesses, is said to be consumptive. So much of the lungs is destroyed, that there is not enough left for the purpose of life, and the patient wastes away and dies. The lungs of the cow after chronic or neglected catarrh, or bronchitis, or pneumonia, or pleurisy, are much disposed to assume this tuberculated and ulcerated state.

A cough is the earliest symptom; but a cough of a peculiar character. It is too common to say carelessly, and sometimes cruelly of a human being, "that person has a church-yard cough!" The prediction is too often verified, for although it would be difficult to describe that cough, there is a character of its own about it which cannot be mistaken. It is so with regard to cattle. The cough of incipient phthisis is an inward, feeble, painful, hoarse, rattling, gurgling one. The farmer will have reason to tremble when he recognizes it, because it reveals fearful disorganization which can seldom be repaired. He needs not, however, quite despair. It is disorganization which may in a few cases be repaired; but in the great, the decided majority of them, will proceed to its fatal termination. At the same time it is a disorganization which does not immediately interfere with the discharge of the functions of life. The beast will fatten, and perhaps almost as rapidly as before. Except, therefore, peculiar value is attached to the animal, it will be prudent not to attempt any medical treatment at all, or at least, beyond that of a mere palliative nature.

If any thing be done, bleeding will be here, as in all other inflammatory cases, the first step, but pursued in a more cautious manner than in any of the others—never pushed beyond the very indication of its proper effect, nor repeated until after due con-

sideration, and a full conviction that renewed irritation is beginning to be set up. To this must be added mild doses of physic, and the use of the sedative medicines, with proper care that the animal is not unnecessarily exposed to the vicissitudes of the weather, and yet avoiding too much nursing.

DISEASES OF THE GULLET, STOMACH, AND LIVER.—*Obstruction in the gullet.*—This is commonly called *choking* whether it occurs in horses or in cattle, and is far more fatal in the former, than the latter, although not so frequent. When a beast is first put on carrots and parsnips, or potatoes, or turnips, he is very apt to be choked if they are not properly sliced out.

When the root sticks in the gullet, and can be evidently seen and felt there, resort is had to some instrument. They who have neither good sense nor regard for the sufferings they may inflict, may take a common stick. Whatever it may be, they thrust it down the gullet, and work it down, might and main, to drive the offending body down.

There is no doubt that some instrument should be introduced into the gullet, in order to push the root into the stomach, but it is the force that is used that commonly does the injury.

Every farmer should have a flexible *probang* ready for use; of which there are some very approved ones; or if he have not a more suitable instrument, a tarred rope, properly covered with silk or leather, may be used. If the obstructing body yields to this, he will be justified in pushing it on within the chest; but, if with the application of a fair degree of force, it is very slowly and with difficulty pushed on, the operator should instantly relinquish the determination to drive it down; for as the gullet becomes smaller on entering the thorax, if it cannot be moved without difficulty in the upper part of the neck, it will not be moved at all in the lower portion of it.

The next consideration is, whether it may not be forced back. A half pint of olive oil should be poured down the throat, and an attempt then made, with the fingers applied externally, to give the body a retrograde motion. By patient manipulation, this will be effected much oftener than is imagined.

We have seen it stated, that in one instance, a cow was relieved by laying her head on a block, and crushing an apple with the blow of a mallet. This may answer where the substance can be easily broken.

As a last resource there is an operation of cutting down upon the obstruction, and thus removing it. But this would require the hand of the veterinary surgeon.

Distention of the rumen from food.—The internal structure of the ox, exhibits several divisions of the stomach. The first of

these is the rumen or paunch, or first stomach. All the food when first swallowed goes there to be preserved for the act of rumination.

Cattle, when first put upon suculent grass or turnips, or when suffered to gorge themselves with potatoes or grains, or even with chaff, will sometimes distend the rumen almost to bursting. It will be distinguished from hoove, from its not being attended with occasional eructation, by the swelling not being so great as in hoove, and by the hardness of the flanks.

When, although the animal may be dull, refusing to eat and ceasing to ruminate, generally lying down and showing great disinclination to move, yet the pulse is not materially quickened, and the muscle is cool and moist, and there is a little heaving at the flanks, a free bleeding and a powerful dose of physic will be sufficient.

But when the symptoms are, dullness, uneasiness, shifting of posture, moaning, swelling at the sides, the flank feeling hard and not yielding to pressure, when rumination ceases, and the uneasiness and moaning increase, and the animal gradually becomes unconscious, this is a most serious business, and will admit of no delay. It is a case that demands mechanical *relief* (if any is afforded), from the veterinary surgeon.

Hoove, or distension of the stomach from gas.—If a beast taken from poor or less nutritive food is put upon green vegetable substances, it eats so greedily and so much, that the rumen ceases to act. Those substances are naturally subject to fermentation, during which much gas is extricated, but when inclosed in the stomach, and exposed to the combined influence of heat and moisture, the commencement of fermentation is hastened, and its effect increased.

The hoove is distension of the rumen by gas extricated from substances undergoing the process of fermentation within it. The following are the symptoms.

The animal gradually becomes oppressed and distressed. It ceases to eat, it does not ruminate; it scarcely moves, but it stands with its head extended, breathing heavily, and moaning. The whole belly is blown up, and this is particularly evident at the flanks, and most of all, at the left flank, for under that the posterior division of the rumen lies. When the rumen is filling there is an occasional eructation of a sour or fœtid character; but when the stomach is once filled, there is no longer the possibility of escape for its contents.

The animal cannot long sustain this derangement of important parts; inflammation is set up, and the circulation becomes seriously and dangerously disturbed by this partial obstruction.

There can be no dispute as to the first object to be accomplish-

ed, in order to save the animal; the gas must be liberated, or otherwise got rid of. Some persons when symptoms of hoove appear, drive the animal about, and keep him for a while in constant motion. There is some danger in this. Some recommend the administration of vinegar, but the propriety of this is doubtful. Others recommend alkalis, and describe them as almost a specific. Ammonia has been extolled as seldom failing to give relief.

Oil, (whether olive, or spermaceti, or castor, or common whale oil, seems to be a matter of indifference) will sometimes prove serviceable in cases of hoove; but it must be at the very commencement, and is, after all, not striking at the root of the evil.

The object to be accomplished is the extrication of the gas, and the prevention of any fresh quantity of it being generated. The farmer or the practitioner, when he sees the case demands immediate relief, takes a sharp knife and plunges it into the left flank, underneath and in contact with which the rumen is found. The gas rushes violently through the aperture, carrying with it steam, and fluid, and pieces of food. The belly falls, and the beast is immediately relieved. The safest place for this operation is the following:—Supposing a line to be drawn close along the vertebra, from the haunch bone to the last rib, and two other lines of equal length to extend down the flank, so as to form an equilateral triangle, the apex of the triangle, or the point where the two lines would meet, would be the proper place for the opera tion, for there is no danger of wounding either the spleen or the kidney. This, however, might be better performed by a properly prepared instrument, such as is used by surgeons in tapping for the dropsy.

The gas is certainly extricated in this way, and generally successfully. Sometimes, however, ill consequences attend it.

But the stomach pump, where resort can be had to it, has now superseded all other remedies. Two drachms of the powdered chloride of lime dissolved in two quarts of water, is injected into the paunch by means of this instrument. This may be repeated an hour afterwards, if circumstances should appear to require it.

The animal having been relieved, and the gas ceasing to distend the paunch, a pound of Epsom salts should be administered with a pound of carraway powder, and half an ounce of ginger; and on several successive mornings, four ounces of Epsom salts, two of powdered gentian, and half an ounce of ginger should be given.

Attention should for some time be paid to the manner of feeding. A mash should be daily allowed, and the pasture on which the beast is turned, should be short and bare rather than luxuriant.

Loss of Cud.—The cessation of rumination designated by the term, *the loss of cud*, is more a symptom of disease than a dis-

ease itself. It accompanies most inflammatory complaints, and is often connected with those of debility. The first thing will be to ascertain the cause of the suspension of the second mastication, and to adopt the treatment to the nature of the cause. A dose of physic, with a very small portion of aromatic medicine, will be indicated if any fever can be detected; more than the usual quantity of the aromatic will be added in the absence of the fever, and still more with tonic and alterative medicine, if general debility is indicated. The carraway and ginger powder are the best aromatics that can be employed, and will supersede every other; the gentian and ginger with Epsom salts, as recommended just above, will prove a very useful tonic and alterative in cases of "loss of cud" that cannot be traced to any diseased state of the animal, or that seems to be connected with general debility.

Inflammation of the stomach.—In almost every book on cattle medicine, mention is made of "inflammation of the stomach;" and certainly cases do, although rarely, occur, in which evident traces of inflammation of the rumen may be discovered on examination after death; but the symptoms during life, are so obscure, that it would be useless to bestow any time on the consideration of this disease.

Inflammation of the Liver.—Cattle, and especially those that are stall-fed, are far more subject than the horse, to inflammation of the liver. This appears evident enough on examination after death; but the symptoms during life are exceedingly obscure, and not to be depended upon. An almost invariable one, however, is yellowness of the eyes and skin, and in addition to the common symptoms of fever, those which would lead to suspicion of this disease, would be, continually lying on the right side, slight spasms on that side, or wavy motions of the skin over the regions of the liver.

The proper remedies are, bleeding, physic, blisters on the right side, and restricted diet, from which every thing of a stimulating kind is carefully withdrawn.

Jaundice, or the yellows.—There are few diseases to which cattle are so frequently subject, or which are so difficult to treat, as *jaundice*, commonly known by the appropriate name of the *yellows*. It is characterised by a yellow colour of the eyes, the skin generally, and the urine. Its appearance is sometimes sudden, at other times the yellow tint gradually appears and deepens. In some cases it seems to be attended for a while by little pain or inconvenience, or impairment in condition; in others, its commencement is announced by an evident state of general irritation and fever, and particularly by quickness and hardness of pulse, heaving of the flanks, excessive thirst, and a suspension of rumi-

nation; to these rapidly succeed depression of spirits and loss of appetite, strength and condition.

In this species of jaundice, as the precise cause is not always observed, the treatment must be according to the symptoms. If there is evident fever, the animal must be bled, and the quantity of blood abstracted be regulated by the apparent degree of fever. In every case but that of diarrhœa, and at the commencement of that, he must administer purgatives—in large doses when fever is present, and in somewhat smaller quantities, but more frequently repeated, when constipation is observed, and in doses still smaller but yet sufficient to excite a moderate and yet continued purgative action, when neither fever nor constipation exists. Considering, however, the actual temperament of cattle, the purgative should be accompanied by a more than usual quantity of the aromatic, unless the degree of fever should plainly forbid it.

Diseases of the Intestines.—These, with the exception of diarrhœa, are seldom so acute or fatal as in the horse; but they are too numerous, and destroy too many of our cattle.

Inflammation of the bowels.—Of this malady, as in the horse, there are two species: the first is inflammation of the external coat of the intestines, accompanied by considerable fever, and usually by costiveness; the second is that of the internal or mucous coat, and generally attended by violent purging.

The first of these is, in most cases, sudden in its attack. Animals of middle age, strong, in good condition, and particularly working cattle, are most subject to it.

The beast on the preceding day seemed to be in perfect health, is observed to be dull, depressed, and muzzle dry, his hair rough; he shrinks when his loins are pressed upon, and his belly seems to be enlarged on the left side. To these symptoms speedily succeed disinclination to move, weakness of the hind limbs, trembling of them, staggering, heaving of the flanks, protrusion of the head, redness of the eyes, heat of the mouth and ears and roots of the horns, and a small but rapid pulse, generally varying from sixty to eighty beats in a minute.

A malady of so intensely an inflammatory character should be met by prompt and decisive measures, and to them it will in its early stage, generally yield.

The patient should be bled. If it is simple costiveness, without fever, the abstraction of six or eight quarts of blood may suffice; but if the symptoms of inflammation cannot be misunderstood, the measure of the bleeding will be the quantity that the animal will lose before he staggers and falls. Purgatives should follow—the first dose being of the full strength, and assist-

ed by quickly repeated ones, until brisk purging is produced. Hot water or blisters should be applied to the belly, and the food of the beast should be restricted to gruel mashes. This will in most instances include the whole of the treatment.

Diarrhœa and Dysentery.—The most proper treatment of acute *diarrhœa* will consist in the administration of a mild purgative, in order to carry off any source of irritation in the intestinal canal; the abstraction of blood, if there is any degree of fever, and then the exhibition of alkalis and astringents. The most effectual medicines are, prepared chalk, opium, catechu and ginger, in the proportion of one ounce of the first, one drachm of the second, four drachms of the third, and two of the last, in each dose; and to be administered in thick gruel. This will generally be successful.

Dysentery may either be acute or chronic. The following may probably be the order of the symptoms, if they are carefully observed. There will be a little dulness, and anxiety of countenance; the muzzle becoming short and contracted; a slight shrinking when the loins are pressed upon; the skin a little harsh and dry; the hair a little rough; there will be a slight degree of uneasiness and shivering that scarcely attracts attention; then (except it be the degeneracy of acute into chronic rheumatism) constipation may be perceived; it will be to a certain degree obstinate; the excrement will be voided with pain; it will be dry, hard, and expelled in small quantities. It other cases, perhaps purging will be present from the beginning; the animal will be tormented with tenesmus, or frequent desire to void its excrement, and that act attended by straining and pain, by soreness about the anus, and protrusion of the rectum, and sometimes by severe cholicky spasms.

When this malady is of an inflammatory type, the first and most obvious, and most beneficial measure, is bleeding; and this regulated by the age, size, and condition of the beast, the suddenness and violence of the attack, and the degree of fever. From two to five or six quarts of blood should be taken. The repetition of bleeding, must depend on circumstances.

As another abater of inflammation, a mild aperient should be administered; and here, as in acute diarrhœa, castor oil will be decidedly preferred to any other. in doses from a pint to a bottle; and a small quantity, ten grains, of powdered opium will not interfere with the aperient quality of the oil, while it may allay irritation. Some judgment will be required as to the repetition of the purgative. This being inflammation of the larger and lower intestines, there will be evident propriety in the administration of emollient injections. This treatment being

pursued for two or three days, powdered opium, in doses of half a drachm, as an astringent and an anodyne, may be given, mixed with thick gruel.

The malady being apparently subdued, there will need for much caution in the after treatment of the animal: he must not soon return altogether to green meat, and more especially to luxuriant pasture.

Colic.—Of this disease there are two varieties. The one is *flatulent colic;* the other *spasmodic.* This latter is the more prevalent. It is spasm or contraction of the small intestines, and accompanied by more excruciating pain than the former. The animal is exceedingly uneasy, lowing, pawing, striking at his belly with its hind legs or his horns, continually lying down and getting up, becoming very irritable, and sometimes being dangerous to handle. It is distinguished from flatulent colic by the small quantity of gas that is expelled, and the comparative absence of tension or enlargement of the belly.

The treatment of this and flatulent colic will be the same, except that as this proceeds ftom irritation in the intestinal canal generally, which is apt to run on to inflammation, bleeding will be earlier resorted to.

The medicine will be the administration of some aromatic drink, but chloride of lime, as in hoove, will be most to be depended on. Two drachms of the chloride dissolved in a quart of warm water, to which an ounce of the tincture of ginger (or two drachms of the powdered ginger), and twenty drops of the essence of peppermint may be added, will form one of the most effectual colic drinks that can be administered.

The beast should be walked about: exercise alone will sometimes cause the gas to be expelled.

Should the first dose, and gentle exercise for a quarter of an hour, not produce relief, a purgative drink should be given, and that of an aloetic nature as likely to operate speedily. To prepare this, take of Barbadoes aloes four ounces, pimento powdered two ounces, and gum Arabic two ounces; pour on them a quart of boiling water; stir the mixture well and often; when it is cold add half a pint of spirit of wine, and bottle the whole for use. Shake the bottle well before the requisite quantity is poured out.

In flatulent colic, bleeding will be resorted to only in bad cases, and when other remedies have failed.

Strangulation of the intestines.—Spasmodic colic, if neglected, or bidding defiance to medical treatment, occasionally leads to such an entanglement of different parts of the bowels with each other, that they become tied into a kind of knot, and the passage of food along them is obstructed. For this there is no remedy. Every case of colic should be attacked in good earnest at first.

40

Inversion of the rectum.—It has occasionally happened in the straining of diarrhœa, and in the still more violent efforts with which the fæces are expelled in dysentery, that a portion of the rectum is protruded.

The protruded part should be thoroughly cleansed and diligently fomented during the space of an hour, with a decoction of poppy heads, lukewarm. Gentle but long continued efforts should then be made to return the intestine, which will be accomplished much oftener than would be imagined, if the operator will have patience enough. The gut having been returned, cold water should be applied round the anus for a considerable time more powerfully to close the sphincter muscle.

Constipation.—The immediate cause of many of these affections of the bowels is constipation. The method of proceeding in such case is sufficiently evident. When the state of the animal indicates the administration of Epsom salts, they should be accompanied by the usual quantity of some aromatic (half an ounce of ginger) and be given in as gentle a way as possible. There can scarcely be a better way than suffering it to run from a long narrow-necked bottle introduced into the mouth. Should not this operate at the expected time, a second dose should be given, and if necessary, a third. Probably a cordial drink (an ounce of ginger, and the same quantity of carraway powder), would be given with advantage.

Dropsy.—This is an accumulation of fluid in the cavity of the belly. The chance of success in the treatment of such a disease must be little.

The first object is to relieve the sad oppression under which the animal labours, and that must be effected by puncturing the belly and suffering the fluid to escape. There is neither art nor danger about the operation. The beast should be tied up close, and the side-line put on; a puncture should be made with a lancet or trochar, under the belly, six or eight inches from the udder, and on the right side; the milk vein and the artery which accompanies it being carefully avoided. The opening should not be larger than would admit the little finger, and if it is made with a trochar, the canula may be left in the wound until the fluid has quite run out. The trochar is a hollow tube, inclosing a sharp instrument. The whole enters the puncture, the instrument is then withdrawn, leaving the tube in the wound. The wound will require no after attention.

Diseases of the Urinary Organs.—The disease termed *red water*, from the colour of the urine, is one of the most frequent and untractable maladies of cattle. It may be divided into *acute* and *chronic*: two diseases often confounded.

Acute red water is ushered in by a discharge of bloody urine, and is generally preceded by dysentery, suddenly changing to obstinate costiveness, and as soon as the costiveness is established the red water appears. There is laborious breathing, coldness of the extremities, ears and horns, heat of the mouth, tenderness of the loins, and every indication of fever; it often runs its course with fearful rapidity, and the animal is sometimes destroyed in a very few days.

Bleeding is the first step indicated. The first bleeding should be a copious one, but the repetition of it will depend on circumstances. Three objects will be accomplished by bleeding. The first, a diminution of the general quantity of blood; the second, a consequence of the first, the removal of congestion to the part; and the third is the giving a different direction to the current of blood.

Purgatives should follow. A pound of Epsom salts should be immediately exhibited, and half pound doses every hour afterwards, until the bowels are thoroughly acted upon. The commencement of purging will be the signal of recovery.

It nevertheless sometimes happens, that the constipated state of the bowels cannot be overcome, but the animal becomes rapidly weaker, while the blood assumes a darker and sometimes a purple or even a black colour. Stimulants should now be given. The common turpentine, the balsam of copaiva, or even spirit of turpentine, especially if it be guarded by the addition of a few drachms of laudanum, may be given with advantage.

Chronic red water is more prevalent than that which is acute, and in its first stage is far more a disease of the digestive organs, and especially of the liver, than of the kidney. The urine is observed to be of a brown colour, or brown tinged with yellow; the beast feeds as well as before, but ruminates rather more lazily. In a few days a natural diarrhœa comes on, and the animal is well at once; or a purgative drink is administered, and a cure is presently effected. This occurs frequently in cows of weak constitution, and in calves.

At other times there is manifest indisposition, and a variety of symptoms present themselves. The urine which at first was brown with a tinge of yellow, has now red mingling with the brown; or it is of the colour of porter. It is increased in quantity, discharged sometimes with ease, at others with difficulty. In every state there is costiveness, and that exceedingly difficult to overcome, but on close inquiry it is ascertained, that there was diarrhœa at the beginning, and which was violent and fœtid, and which suddenly stopped.

As to the first step in the treatment of chronic red water, there is a difference of opinion among veterinary surgeons; many strong-

ly recommend bleeding, and others as strenuously deprecate it. The truth is, the propriety of bleeding depends on the condition of the beast, and the degree of fever; if the animal is in high and fair condition, if there is the slightest degree of actual fever, nothing can excuse the neglect of bleeding. The quantity taken must be left to the judgment.

With regard to the next step, there is no difference of opinion. The animal must be well purged, if he is in a constipated state; or if there is any discharge of glairy fæcal matter, the character of that must be changed by a purgative. This should be Epsom salts. It should consist of at least a pound of salts and half a pound of sulphur; and should be repeated in doses consisting of half the quantity of each, until the constipation is decidedly overcome.

Black water.—This is only another and the concluding stage of red water.

Inflammation of the Kidneys.—Cattle are occasionally subject to an affection of the kidneys bearing considerable resemblance to acute red water, but attended by symptoms of pure inflammation of that organ in other animals. At first there are seldom any indications of disease beyond a straining effort in voiding the urine, and which is ejected forcibly and in small quantities, the loins being more than usually tender, and perhaps a little hot. In a day or two afterwards, however, the beast becomes dull and careless about his food; the difficulty of staling increases; blood is perceived to mingle with the urine; the muzzle becomes dry; the horns and ears cold; the pulse frequent and hard, and the breathing quickened. Diarrhœa or dysentery is now observed; the evacuations are fœtid. They too are discharged with effort and in diminished quantities, and at length cease to appear. These symptoms progress, and in three or four days the animal dies.

The treatment will comprise copious bleeding, active purging, the administration of emollient clysters, fomentation over the loins, or the application of a mustard poultice to them, bran mashes, gruel, and a small quantity of green succulent food. Castor oil without stimulating ingredients, will be the best purgative. Both the oil and the clysters should be continued until the inflammation has perfectly subsided.

Horn distemper.—In the Spring, cattle which have been poorly kept through the Winter, are subject to wasting of the pith of the horn, which is usually called the horn distemper. It is sometimes in one horn only, and sometimes in both. The indications of the disease are, coldness of the horn, dullness of the eyes, sluggishness, want of appetite, and a disposition to lie down. When the brain is affected, the animal will toss its head, groan, and exhibit indications of great pain.

To cure this disease, it is recommended to bore a hole with a nail gimblet into the lower part of the horn, through which the foul matter may be discharged. By this boring, which should be nearly horizontal, or in the depending part of the horn, and two or three inches from the head, the cure is sometimes completed. When it proves otherwise, a mixture of rum and honey with myrrh and aloes should be thrown into the horn with a syringe, and be several times repeated if the disease continue.

It has been recommended, also, to give one or two spoonsful at a dose, night and morning, of the following preparation: take of salt one half pint, of soot one half pint, of black pepper one table spoonful, make all fine. This powder has been administered by drawing out the tongue of the animal, and putting the spoon as far down the throat as it will reach, then letting go the tongue and keeping up the nose.

Sometimes the diseased part of the horn is sawn off, and the part dressed with turpentine.

Predisposition to disease.—Improper feeding is injurious to neat cattle generally; but improper management with respect to water, is productive of more serious consequences still, and is the chief origin of what is called among veterinary surgeons, *predisposition to disease;* in other words, the animal structure is, by mismanagement, rendered peculiarly liable to disease, and is acted upon by the slightest cause.

Thus, a superabundance induces the joint-murrain, red water, scouring, &c.; while a smaller quantity than is proper, is often a main cause of inflammatory disorders.

Filthy or impure water should be avoided as productive of the most serious consequences; it has been proved beyond all doubt, that impure water given to pregnant cows is a more certain cause of abortion, or slipping of the calf, than any other, and also engenders bad udder, red water, and scouring, and materially diminishes the quantity of the milk, and injures the quality of the butter and cheese.

Neat cattle, but particularly cows, should be watered twice a day, and in Summer three times; this is the more necessary when they are kept on dry food: the water should be pure and transparent; the best of all is that which has been agitated by passing through a mill, as it is then softer and more favourable to digestion. It is a dangerous prejudice, that muddy or stagnant water is not injurious: we have already given a decided opinion on this subject, and must again press it upon the serious consideration of the breeder of cattle of every description.

It is always advisable, when it can be conveniently accomplished, to pump the water intended for cattle-drink, into troughs

of stone or cement; the best ponds of water being liable to impurity from several causes: as one of these, it may be observed that they invariably void their excrement either in the pond or near it, immediately after drinking! and as there is generally a sloping bank to the pond, the dung must in some degree run down into the water, and by engendering various descriptions of the insect and vermin race, render it impure and unwholesome.

The water of ponds surrounded with ash trees, is often during the Summer covered with the cantharis or blistering fly, which the wind blows from the leaves of the trees. These insects, when swallowed with water, are certainly poisonous. This is particularly the case in France, but not so much so in England; still, the same cause exists, though in a less degree, wherever ponds are overhung by branches of trees.

Water is rendered much softer, and produces more milk, by being blanched, as it is termed; that is, by having a little bran or meal stirred into it; but water so prepared must not be kept too long, as it is apt to ferment and become sour. During the heat of Summer, cows are very apt to become costive, particularly where they are kept principally on dry food; in this case it will be necessary to give them water in which bran and linseed have been boiled; and even if they are not costive, it will be proper to add occasionally, about a sixth part of a pint of vinegar to every pail of water, and especially so when the water is of an indifferent quality, or when the weather is very hot and dry.

It is a fact, that when cattle have been accustomed to drink impure water, even from the washing of a dungheap, they will acquire a relish for it, and refuse good water if offered to them: but the consequences arising from this practice, although not always immediate in their visible effects, are certain, and sap the very vitality of the animal's constitution. We have stated that such a practice is a frequent cause of abortion, and productive of various and serious diseases; and we here repeat the caution, from a conviction that no other water should ever be given to cattle than what is pure, sweet, and wholesome; and that the use of that which is impure, although used for a time with apparent impunity, will not only inevitably produce disease, but will lay the foundation of a train of disorders which will rarely, if ever, be eradicated.

CHAPTER VII.

SHEEP.

The varieties of sheep are so numerous, that at first sight it appears almost impossible to reduce them into any regular classes. They may, however, be divided in two ways: first, as to the length of their wool, and secondly, as to the presence or absence of horns. A third classification might be made after the place or district in which such species are supposed to abound, to be in the greatest perfection, or to have originated.

The long-wooled British sheep, are chiefly the *Teeswater*, the old and new *Leicester*, the *Devonshire Nots*, *Exmoor*, and the *Heath* sheep.

The short-wooled sheep are chiefly the *Dorsetshire*, *Hereford*, or *Ryeland*, the *Southdown*, the *Norfolk*, the *Cheviot*, the *Shetland* sheep, and the *Merinos*.

Of these, the hornless breeds are, the Teeswater, the old and new Leicester, the Devons, the Hereford, the Southdowns, the Cheviot, the Shetland, and Merinos.

The sheep best suited to arable land, an eminent writer observes, in addition to such properties as are common, in some degree, to all the different breeds, must evidently be distinguished for their quietness and docility; habits which, though generally acquired and established by means of careful treatment, are more obvious, and may be more certainly depended on, in some breeds than in others. These properties are not only valuable for the sake of the fences by which the sheep are confined, but as a proof of the aptitude of the animals to acquire flesh, in proportion to the food they consume.

The long wooled large breeds, are those usually preferred on good grass lands; they differ much in form and size, and in the fattening quality, as well as in the weight of their fleeces. In some instances, with the Lincolns, or old Leicester, in particular, wool seems to be an object paramount even to the carcass; with the breeders of the Leicesters, on the other hand, the carcass has always engaged the greatest attention; but neither form nor fleece, separately, is a legitimate ground of preference; the

most valuable sheep being that which returns, for the food it consumes, the greatest marketable value of produce.

BREEDS.—The proportions which the different kinds of stock should bear to each other upon a farm, can be determined only by the position and circumstances wherein it is placed. A due quantity of sheep, in most situations, is found the source of great profit to the husbandman, whilst they afford the means of ultimate improvement to the land. Their breed is a matter of serious consideration, and in some countries of Europe, distinguished by good policy, it is considered so important, that it has been made a subject of legislation, to guard by the severest penalties against the exportation of any individual of this valuable race.

I have always considered, that the introduction of Merinos was fortunate, merely as it gave the means of crossing various breeds of our native and imported sheep; not in affording the material for cloths, fitted but for the rich, and crooked ill flavored little carcasses, disdained even by the poor. The average weight of the fleeces produced by the best Merino flocks, when made perfectly clean, seldom exceeds two and a half pounds per head, which, at fifty cents per pound, would equal but one dollar and twenty-five cents each. The weight of its carcass may fairly be stated at from thirty-five to forty pounds. The bad quality of the mutton, or its ill appearance upon the stall, or possibly some prejudice existing against it in this country, as in Spain, whence the animal was brought, makes it less valuable for the shambles than the most common sheep, bred upon the worst managed farms. If the market afford a test by which its value can be shown, it may be stated that no mutton is so little sought.

Several sheep have been brought within fifteen or twenty years from Great Britain, Ireland, Germany, and Holland, to this and the neighbouring States. The most valuable which I have traced, are the Southdown, Dishley, and Teeswater sheep, carried by Captain Beane to New Jersey; those brought to Pennsylvania by Captain Jeffreys; a male and an ewe imported by Mr. Waln; some Teeswater and Dishley sheep, taken in a prize to New York; the Texel sheep, imported by Colonel Perkins of Boston; and the admirable Tunisian mountain sheep, for which Pennsylvania is indebted to the liberality of Colonel Pickering, "who having received them in a national ship," caused them to be distributed in this State, in preference to his own. I know no instance of improvidence or want of judgment more glaring among Pennsylvania farmers, than has been evinced in their neglect of one of the most useful and most hardy families

of sheep, which, in this country, I have ever seen. The praise which has been bestowed upon them by a zealous, and one of the earliest and most distinguished promoters of agricultural science in America, my experience has satisfied me is just. They arrive early at maturity, carry good fleeces, afford delicate mutton, lay their fat well within, and except the Dishley and Southdown breeds, are more easily kept than any sheep I can find. The great objection to them is the obstruction opposed to procreation, by the unwieldly excrescence adhering to their tails. If an ewe lose her lamb early in the season, the chance of impregnation is very small. Various expedients have been resorted to in vain, to remove the difficulty, which, when the animal is *fat* and *thorough bred*, it is impossible to obviate, even by the assistance of the shepherd's hand.

I have obtained, I believe, the remnant of the best flock which could at any time have been found in this State. I have crossed them with Beane's mixed Dishley and Southdown stock. I hope to obtain the hardiness and fine mutton of Tunisian sheep, with the better form, smaller bone, wider chests, longer fleece, early maturity, and singular tendency towards fat, of some of the best individuals of the other family, without the useless incumbrance of a heavy and broad tail. Without attempting to decide in favor of the suggestions of Mr. Livingston, that this appendage is the result of art, I think every breeder will agree with me, that it is as absurd to propagate a race of animals, carrying, if I may be allowed the phrase, a fifth quarter in the tail, which, however delicate to the palate of a Turk, is not likely to become fashionable in America, and therefore cannot be more profitable than any other augmentation of offal, as it would be to seek the enlargement of bone.

Dishley sheep are remarkable for arriving early at maturity, for consuming less food, laying on more fat, affording more weight, with less offal, than any family of sheep known. They are not hardy, their flesh is not so delicate in flavour, nor is their proof within so good as that of the Southdown, and some other breeds. Their proportion of fat to flesh on the outside is so large, that in this country, where pork supplies the place which gross mutton finds in England, pure Dishley sheep never can, I apprehend, be generally introduced. In England, they are not usually eaten by the more wealthy classes of people who prefer the small Scotch, Welsh, and Southdown breeds.

Southdown sheep have finer fleeces, of shorter staple, and much less weight; smaller carcasses less loaded with fat, showing more proof within, affording mutton of finer texture, and better flavour, than any breed known. Their form is not so accurate, their fore-quarters being lighter, and their necks longer

than those of Dishley sheep; but their chests are sufficiently wide to afford ample space for the position of their lungs; upon the healthful action of which, all scientific and practical men agree the vigour and useful secretions of the animal must depend. They are much more hardy, have not much more offal; they consume rather more food in proportion to their size than Dishley sheep, but by their vigour and activity, are enabled to find support, and to thrive upon bleak and barren hills, where Dishley sheep would die from exposure, or would starve.

The various flocks called Bakewell, in New Jersey, Delaware, and Pennsylvania, are derived from Beane's importation of Dishley, Southdown, and Teeswater, mixed in some instances with Merino, native, and Jeffrey's breeds. Some individuals are strongly marked, not only by the speckled or smutty faces of the Southdown, but by their fleece and peculiarities of form. The excellence of the mutton would be cited, to prove that my opinions of the "*English Bakewell*" sheep must be incorrect, if it were not understood, that the texture and quality of the mutton have been exceedingly improved by the Southdown or native cross; although the value of the fleece, and excellence in form, have certainly been diminished.

I conceive that *extraordinary* size is not to be desired in any domestic animal, unless it be obtained without extraordinary labour or food. The great object to be sought by all breeders, whether of neat cattle or sheep, is the race which will return most profit at *least cost*, and in the least time. If our inclosures were all sheltered by hedges, and our flocks were all guarded by shepherds and their dogs, and afterwards watched, and most carefully nursed both by night and by day, at the season of yeaning, with all the attention which the low price of labour and high price of land only can justify, I should recommend thorough-bred Dishley sheep. But whilst our attention must be chiefly directed to the propagation of stock, which can be bred and reared in those districts of our country, where by the labour of a few days a man may become possessed in fee of an acre of land, it would be absurd to introduce a family of animals, which require as much nursing and care, as the hardy settlers in the forests of America generally devote to the young of their *own race*. I am therefore endeavouring to "breed out" the Dishley blood, to obtain the Southdown in as much purity as possible from the mixed race. Most of our sheep breeders have fallen into a common mistake, in following what is supposed to have been the practice of Mr. Bakewell, whose secret has never been divulged. By "breeding in and in," they have made the frame and legs too short, the bone too fine, the constitution tender, and the fleece unusually light, in the vain attempt to regain the ex-

cellence of the original flock.—(*J. H. Powell, Member of Penn. Agricultural Society.*)

BREEDING OF SHEEP.—Persons about to enter into the sheep husbandry on a considerable scale, after they have determined upon the breed, have two principal points for consideration: *first*, the quantity of stock which the farm is capable of carrying; when the proper number has been determined, so that the farm is neither understocked nor overstocked, this should always be kept up, the fattest and oldest sheep being annually turned off, and their places supplied by the young sheep, which spring from the increase; the rigid observance to this rule is necessary, to keep the stock young and healthy. *Secondly*, the stock should be purchased from a soil rather inferior to the farm they are intended to graze upon, by which means greater room is afforded for improvement. Sheep brought from very rich lands, upon a moderate soil, will fall off, generally, in despite of every attention.

Shepherd.—These preliminaries being adjusted, an experienced shepherd, whose business exclusively should be to attend to the sheep, is indispensably necessary. A flock of one thousand sheep, will keep one man occupied the year round, besides requiring some assistance at the lambing time; and it is utterly impossible for a flock of half that number to prosper, where no particular person has charge of them. If a flock of sheep wants improvement, there should be a shepherd to know the history and habits of every individual sheep on the farm; and if the flock is in a very high state of breeding, his constant care is equally necessary, to prevent its degeneracy; besides, in a large flock, something occurs every day to require interference, whether in the daily inspection to see that they are tranquil in their respective fields, or in the necessary operations of changing their pastures, drawing them into assortments, and attending to the details of their progressive improvements; it is obvious, that all these matters, upon which the profit of a flock entirely depends, must be in a great measure neglected, if the sheep are permitted to wander about, and are only occasionally looked after by different persons, who, having no particular charge over them, can feel none of that lively interest which a good shepherd always does for his sheep.

An experienced person of this description, is always provided with a regular bred dog, which upon general occasions affords him more efficacious assistance than any number of men could do; those who have never witnessed the extraordinary sagacity of these animals, and the intelligence existing betwixt them and the flocks they belong to, will find it difficult to imagine how one man

can attend, in a sufficient manner, to the incidental details of a flock of one thousand sheep; but an active man, with a good dog is competent to all this. If the shepherd wishes to change their pasture, he goes with his dog to the gate of the field where they are, and gives him his orders in a very few words, "bring 'em out." In a few minutes, be they in what part of the field they may, the sheep are brought to the gate with the dog behind them. The shepherd then precedes, and the dog brings up the rear, until they arrive at their destination; or if the object is to separate a flock, the dog takes them into a corner and keeps them there, nothwithstanding their anxiety to get away, while the shepherd selects the sheep he intends to draw, (always catching them by the lower part of the thigh,) with more ease than if a dozen men were assisting him. The most valuable dogs of this kind, are thought to be those who have a great deal of fox blood in them; and to procure this, bitches, when in the heat, are sometimes fastened up for a while in the woods, that they may couple with a dog fox. A breed of this kind is more readily disciplined than any other.

The sheep and shepherd being provided, the flock should be divided into kinds; the rams, the wethers, the ewes, and the weaned lambs; and these again subdivided into moderate companies, not exceeding one hundred in a company, where the flock is large; in doing this, particular attention should be paid to separating the weaker sheep from the stronger ones, that they may have at least an equal chance for a choice of food, which indeed they are most in want of; on this account, weaned lambs should never be permitted to run with older sheep. This arrangement should be faithfully persevered in during the Winter season, as the stronger animals will always prevent the weaker ones from getting any thing but the refuse of the fodder.

The first point which should engage the attention of a proprietor who relies upon the shepherd principally for management, is the condition of his flock, both Winter and Summer, as to flesh. Sheep, often in the Spring of the year, particularly ewes with lamb, look apparently in good order when they are miserably thin; the least examination with the hand, will satisfy a person with common knowledge in these matters, whether they have abundance of food; for where the flock is thin, it is certain they have been neglected. Sheep, on the contrary, which have had abundance of proper food, are always in flesh and in a thriving state; and this is indispensable, equally to their welfare and to the profit of the owner, which, indeed, are one and the same thing; the first is brought about by judicious means, and should be the main object kept in view during the whole year.

Tupping.—Where there are plenty of turnips in store, (and

where there are not, large flocks of sheep cannot be kept to the greatest advantage,) the tupping may commence about the 20th October, beginning with a small company of strong ewes, who are good milkers, and increasing the number every few days until the 1st November, when the full stock of breeding ewes should be divided into companies, each having its tup, selected in a judicious manner for the ewes he is to run with; these companies should be kept separate: the tups of each company with their respective ewes, should have a small round spot marked well on the wool. Each company on a particular part of the body, that the progeny of the respective rams may be known, and the sheep be readily separated if they get mixed. The tups, also, should be well rubbed every two days with red chalk, under the breast, to mark the ewes, that the shepherd may observe the progress of the tupping.

Lambs.—The lambing yards being prepared with a few convenient stalls for ewes that require particular attention, the shepherd is understood to be continually with his sheep, day and night, having a convenient place to sleep in adjacent to the lambing yard: a regular shepherd understands that this is the most important part of his duty, and cheerfully performs it. As the lambs will begin to drop in March, an assistant should now be given to him, to attend to foddering the general flock with hay and turnips, and give him what aid he may require. Young ewes at this season, have frequently very difficult and prolonged births; the moment the forehead and fore paws are fairly out, the shepherd lays the ewe carefully on her back betwixt his legs, takes hold of the paws, and gently drawing them, extricates the lamb. In this manner tho ewes are saved a great deal of pain and exhaustion. If the ewe and lamb are stout, and it takes well to its dam, they may at once be put into a division of the yard kept for that purpose, and where not more than twenty are kept at a time. At the end of four days, they should be taken to a large division containing older lambs, and these, when a fortnight old, are removed to a yard which communicates with a meadow, which has not been fed off after mowing; the ewes will find abundance of nourishing food in the rowen, and with the aid of turnips twice a day, will give plenty of milk.

All these arrangements are very simple, and effected with very little expense, whilst the benefits of them are incalculable.—When the lamb is weakly or does not suck well, or when the ewe does not come to her milk, or will not take soon to her lamb, they should be removed to a pen by themselves, and receive particular attention. In a large flock, there will sometimes be twenty or thirty couples in these separate pens, and each, perhaps, for a distinct cause; the utmost vigilance on the part

of the shepherd, is therefore required. If the ewe is several days in coming to her milk, having, perhaps, a very large hard bag, which is sure to come to in the end, the lamb should be suckled occasionally from a new calved heifer, of which there should always be one or more at the disposition of the shepherd, until the milk of the dam will maintain it. If the ewe is obstinate, she must have the lamb repeatedly put to her, and be stood over whilst it sucks; it is not one ewe in a hundred, but will come to in time by persevering in this plan: the moment the mother's nature manifests itself, they may be turned into the meadow, as there is never a relapse to be apprehended; they should, however, be observed for a while.

When a ewe has lost her lamb, a twin lamb may be successfully substituted, by putting the skin of the dead lamb on it for a few days, and standing over her whilst she suckles it. As soon as the object for which they were put in the pens is accomplished, they should be turned out into the meadow or some of the division yards. By a careful attendance of this kind, an extensive lambing may be conducted with very little loss, and the lambs will get all the size they want to enable the shepherd safely to wean them on the first of August. It is true, all this may be nearly dispensed with, by deferring the lambing season to the month of May, when the grass is up; but where lambs come so late, they cannot be weaned either in sufficient season to bring them in good condition into the Winter, or to permit their dams to get into the order they ought to be in, which has the effect of injuring the next crop of lambs, and prevents the first from obtaining the growth they ought to have for the butcher at two years old.

As soon as the ewes have got lambed, all the coarse wool about their tails should be clipped off and put by. Sheep are frequently subject to scouring, on their first feeding on grass, particularly if it is accompanied with wet weather; and the wool, if not clipped off until shearing time, gets very filthy, and breeds maggots; when accustomed to turnips through the Winter, they are not so apt to scour with the first grass.

Cutting and docking.—When the lambs are about three weeks old, the operation of cutting and docking may be performed. The shepherd first selects the males which are intended to keep over, and then proceeds to cut the rest; the most approved way is, for one person to hold the animal under the shoulders, with the belly towards the operator, who with a sharp knife slits the end of the scrotum, and having gently forced the testicle to the orifice, takes hold of it with his teeth and draws it out; the chords are then cut, and replaced, closing the orifice with the thumb and finger. The lambs do not suffer, and get

well directly; if any of them swell, they should be examined and opened, and washed with a little salt and water. It sometimes occurs, that only one kernel can be found, the other being behind the kidneys; these animals should be marked and disposed of as soon as fat; as when they grow up they are very restless at the tupping season; on this account, they are by some called teazers.

The operation of docking consists in cutting the tail off to a moderate length, permitting it, however, to come a good part of the way down the twist, or the junction of the thighs. In rams, this should be left much longer, as it adds to the beauty of their appearance. Docking is only to be recommended on the score of cleanliness. The lambs being all well brought into the Summer, all that is necessary is to pay constant attention to them and their dams, bringing them on as fast as possible with abundance of grateful food; visiting every company at least once a day, and giving them salt two or three times a week. Especial attention should be paid to watering sheep every day, if possible; an absurd notion prevails with many farmers, that sheep will do without water; the best method is to have ponds in fields where there is no run of water, or where the small streams dry up in times of drought.

Weaning.—By the first of August they should be weaned, and sometimes it is necessary to take the ram lambs off before. The mothers should, for the first ten days, be removed to a distant part of the farm, as it is difficult to keep them apart, if they are left sufficiently near to hear the bleatings of their young; the sooner they are brought to a state of tranquillity the better. In order to facilitate the management of so many subdivisions of the flock, as are necessary, the shepherd should have a pet in each company; the sheep will then come to him more readily, when he wishes to examine them, or to salt them; this is accomplished with very little trouble, by a kind and judicious shepherd. It is, also, extremely important to keep the tups of the farm, after the first of September, at a great distance from the ewes; for the moment the tupping season approaches, the males will neglect their food, if the ewes are near them, and will continually hunt the fences where they are; both ewes and rams are thus prevented from thriving as much as they would do, if they were kept at a sufficient distance from each other.

Shearing.—The method of shearing which prevails generally in this State, is a very defective one, and ought to be abandoned; we see animals thrown on a table with their legs tied, and their necks hanging down, whilst the shearer, without any system, commences indiscriminately, at the head, neck, or belly, and cuts from the rump to the neck. A more approved method is

to place the sheep on its rump, betwixt the shearer's legs, on a clean floor; an incision is then made in the wool, from the bottom of the belly to the throat; the belly wool is then taken off, and laid aside; the shears then clip from the throat to the nape of the neck, and from the edge of the belly to the spine; when one side is finished, the sheep is turned, and the other side is finished in the same manner; this method of clipping round the sheep, is much to be preferred to the one in common use, and leaves the animal in a very neat finished state; to cut uniformly close, the clips should be short and quick, not withdrawing the shears as long as the fleece is in a fair position; the practice of taking off the shears every stroke, leaves the wool in hummocks, and is wasteful. It is worth any person's while to take a lesson from an English shepherd, who wishes to have his sheep neatly and profitably shorn.

The belly wool is then rolled in, and the ends gathered up, taking part of the body of the fleece, and not the ragged neck, and drawing it gently out, to form a band to secure the fleece. This band should be well twisted, and tucked in, or the fleece will get out of order, and the purchaser, perhaps, make objections to it; nothing determines purchasers more, than the clean and neat state in which the wool is put up; they know perfectly well, that these circumstances indicate a careful owner, and of course a good stock, and will always give such wool a preference; on this account, the sheep should always be carefully washed and dried before shearing, and the fleeces packed up without the least speck of dirt about them; what is fair and proper in itself, is always the best policy in the long run.

I have known some persons in this State shear their lambs; but having never done it myself, shall merely remark, that on general principles, I think it a dangerous practice, and very problematical whether, under the most favourable circumstances, it can be profitable. Young ewes should never be put to the tup under eighteen months; but ram lambs, if very forward, may go to a few ewes, not exceeding thirty, without retarding their growth materially; at two years old, a complete tup will serve one hundred ewes.

Diseases.—Of the diseases of sheep, happily in this State, little is necessary to be said; the losses under this head, with careful management, do not exceed two per cent. annually; although it frequently exceeds twenty times that amount, where necessary attention is not paid.

Sheep in good condition seldom suffer much from the common sheep tick, and where it prevails, a strong decoction of tobacco leaves, mixed with a little turpentine, well rubbed on their skins

when shorn, will destroy all their eggs, and the next fleece will come off perfectly clean; when ewes are treated in this manner, the lambs also should be moderately rubbed.

The foot rot, also, makes them a little lame, but it is easily stopped; they get this in wet pastures, when the glands swell and suppurate. Caustic washes, applied to the hoofs, and clean dry pastures, will recover them, but it should be attended to in season.

Itch and Scab.—Where there is a disposition to itch and scab, an ointment formed of melted suet, mixed with oil of turpentine, is recommended to be gently rubbed on the blotches. This disorder affected the first flocks of Merino sheep, which were imported into this State, and probably arose from bad keeping on board the ship. I had a large flock affected with it, but by giving the animals sulphur as a medicine, and rubbing them with this, and a decoction of tobacco often, we at length eradicated it. The common blue ointment was also applied with success, but it is a dangerous remedy, as when highly salivated, they are almost sure to take cold and die.

There is also a bee, *oestrus ovis*, which is the cause of great anxiety to sheep; it is to avoid this insect, we see them herding together, and holding their noses close to the ground; it always endeavours to lay its eggs in the nose; the maggot, when hatched, crawls up towards the brain, and when it succeeds in making a lodgement, vertigo and death ensue; this has happened to perhaps half a dozen of my sheep in ten years. I had their heads opened, and uniformly found the maggots there, and of a large size. When the insect has got thus far, the animal leaves its food, and becomes insane, turning round, and running against every thing. As death is sure to ensue, a cure, perhaps, may be attempted by a surgical operation, but I should prefer the knife.

Rot.—The rot is a disease which is fatal to sheep in many countries, but is unknown where I reside: this is acquired on rank humid pastures, particularly which have been overflowed in the Spring; if suffered to get ahead, the mortality is very great. On opening the sheep, an animacular insect, called fluke *fasciola hepatica*, is found in the biliary ducts of the liver. From the circumstance of the rot being communicated on low grounds, which have been overflowed, and only in the Autumn, it is probable that the animalcula is produced by the action of the sun on the putrid remains of the water, and taken by sheep with the grass. It is never known to prevail on high dry grounds, and sheep should be removed to such lands, on the first attack. I have heard, with I do not know what truth, that this disorder prevails greatly both with sheep and cattle, in some parts of the state of Ohio.

Bleeding.—There are certain weeds, particularly the John's

wort, which lambs will feed upon after weaning; if this is done to a great extent, it has the invariable effect of swelling their ears, chops, and throats; if the animal is not attended to, the head and ears, and sometimes the body, will be covered with a dry feverish scab; when it is permitted to go to this length, it is difficult ever to make a good sheep of such an animal. Bleeding is an excellent remedy for the incipient state of this complaint; the most approved method of bleeding with experienced shepherds, is to bleed in the cheek, half-way betwixt the eye and the corner of the mouth: by pressing the angular vein in the lower jaw, the proper vein will swell in the cheek, and the sheep being fixed between his legs, a cut across the vein with a sharp knife, will bleed the animal freely, which it is difficult to do in any other part.—(*Mem. Board of Agr. N. Y.*)

There are two subjects, connected with the raising of sheep, to which I beg leave to direct your attention. The one is, the most proper time of the year to turn the bucks into the flock—the other is, the shearing of lambs. On the former subject my practice differs from most farmers. I am an advocate for raising early lambs. The practice of keeping the bucks away till the fore part of November, I believe pernicious, and one cause why so many flocks degenerate. It is unnatural. Providence has pointed out the best season for animals to breed—at the time the females are in season; and I do not believe we shall gain any thing by altering the course of nature. We suffer every other animal to take its own course. My arguments in favor of the practice of suffering the bucks to lie with the flock during the season, are the following:—When the bucks are turned into a flock late in the season, so many of the ewes are in season at the same time, that the offspring are feeble. The cold winds and frequent storms of the Spring, together with the difficulty of keeping sheep confined at that time of the year, I have found more destructive to lambs than the cold nights of Winter. Early lambs are also more apt to have lambs the first year. My practice is to keep my sheep sheltered from rain by open sheds, and shut up the sheep and lambs about one week in a warm stable; and when they are a month old they will eat hay with the flock. But the sheep must be continually kept up with corn and succulent vegetables, or they will neither give milk for their lambs or bear fine wool.

There is one more benefit which arises from the practice of raising early lambs, which is, the opportunity it gives for shearing them in the Summer.

I have had two year's experience in that practice, and am much pleased with it. My wool averaged, when washed per-

fectly clean, twenty ounces to the lambs, and sold for fifty cents a pound. The fleeces of the yearlings, having been well washed on the sheep's back, averaged about two pounds and a half. The wool was the best I ever sheared. It was of short staple, but even, and exceedingly fine and soft. It is well known to the growers of fine wool, that the fleeces of yearling sheep are not good because the outer ends of the wool are coarse and dead. Hence it is necessary to clip such fleeces, before they can be manufactured into fine cloth. This evil is wholly remedied by shearing the lambs.

The time for shearing lambs is generally supposed to be about the first of August; but if lambs are allowed to fall in the Winter, I think that almost a month too late. They ought to be sheared as early as possible, that the succeeding fleece may have more time to grow, and that the lamb may be eased of his "cumbrous load," before the hot weather is in a measure past.—(*Mem. Board of Agr. N. Y.*)

Feeding and fattening sheep.—Perhaps there is no domestic animal that requires more nice and constant attention than the sheep, and no other that will more richly pay for generous keeping. Though he may not be more liable to disease, nor require a better quality of food than neat stock, still that management which will keep cattle in good case will not answer for sheep. His habits and mode of feeding are entirely different. For instance, in the Winter season a cow may be kept tied to the stall, twenty-two hours out of twenty-four, and, if fed three times a day, keeps her flesh and gets sufficient exercise for her health. Serve a sheep in the same manner, and it would probably not live a month. It is natural for sheep to move about and change situation. Turn a flock of hungry sheep into a pasture and they will run to the end of it before they begin to eat; feed them in troughs they will run over all till they come to the last, when they have it in their power. They are almost continually shifting situation from hill to dale, from one kind of food to another, and it is a fact that sheep will thrive better on two or three different kinds of ordinary fodder, than they will to be confined to one kind that is of a superior quality.

Yarding.—The proper time to yard sheep in the Fall, is while they are yet in good order from fresh feed, and before the frost takes the nourishing qualities from the grass. For when sheep are left to nibble over the frozen pastures, they lose the flesh of half a Summer's keeping, which it takes them half the Winter to regain. It is a great error to persist in such a practice under the idea of saving fodder. But setting aside the injury done to pastures by close feeding at this season of the year, the sheep which

stray away and are lost, and the time spent in hunting them, which are not idle considerations, the farmer wonld more than get repaid for his extra fodder, and a few weeks' attention in yarding his sheep, by preserving their health and condition.

When they are put to Winter quarters, they require as much variety as possible, not that they want so much room, but they need a number of different apartments. Two yards and one shed will do very well for one flock; or what will answer the same purpose, if a large number of sheep are to be kept near each other, have the yards in a row and one more yard than flocks of sheep. Then by shifting one flock to the spare yard, it leaves another vacant, and so on. Thus may all be changed, which should be done at every time of feeding. As fast as the yards are empty, the food should be put into them, and never while the sheep are there. Cleanliness is of the utmost importance. Their yards should be littered with straw or something of the kind constantly, or they will be in danger of losing in a degree a relish for their food.

Hay Mangers.—The next thing necessary is to have a proper place for your sheep to eat hay in, which are the common board mangers, and may make partings to the yards. Take six joists, say three inches square and four feet long; have the boards of a length, then nail two of them to the joists set up perpendicularly in such a manner that one joist will be in the middle of each board, and the other two at the ends, and that the top edge of the boards will be one foot from the ground; then nail short boards on the ends two feet and a half long, the width of the manger, the next boards on the sides to be placed eight inches from the lower boards, then board it tight to the top of the joists, and the manger is finished. A manger eighteen feet long, of this description, will accommodate thirty sheep. Single mangers may be made along the outside fence of the yard, which do not require to be so wide. The great superiority of these mangers over racks is, first, the facility of putting hay into them without dropping it on the ground; secondly, it obviates the danger of hay seed falling on the wool of the sheep; and thirdly, it prevents any waste of fodder.

The next thing after mangers for hay, should be a place appropriated for feeding out roots, which every farmer should raise to a certain extent. Although we cannot turn them to so good an account as the English feeders do, on account of the severity of our Winters, still a proportion of them as food for our stock, is of great importance. In order that the farmer may make the most of his roots, he should have a cellar fixed to receive them in the Fall, without too much labour, and accessible at any time in the Winter, without endangering them by frost. The cellar

should be placed as near the yard as practicable, with a watering place at hand. A good way of washing roots is to have an oblong box that will hold two or three bushels, with the bottom perforated with augur holes, and rockers placed on the under side of the box; then by pouring in a little water and rocking them, the dirt will directly wash through the bottom of the box. They should then be cut fine with a sharp shovel, and they are fit for feeding out. Browze, in the Winter, occasionally, for sheep is very palatable, and is of considerable use in preserving their appetite, and as a change of food, but care should be taken to select the right kind. There are many kinds of hard wood, of which the bark and buds are very injurious. The bark of the black cherry tree, eaten by ewes with lamb, is almost sure to produce abortion. Generally winter-green is to be preferred to any other browze. White and yellow pine are best. Sheep will do very well without water in Summer, as they feed when the dew is on the grass; but they need water in Winter, especially if fed mostly on dry food.

Regularity in feeding Sheep is of prime consequence in cold dry weather. It is not necessary to feed them oftener than three times a day, if discretion is used in the quantity of fodder. In warm weather, and especially if it is muddy, they should have a little at a time, and be fed four or five times a day. Some calculate that two pounds of hay are enough for the support of one sheep a day, (which by the way, in our climate is not enough). Calculations of this kind, if made with the utmost accuracy on one or any number of sheep at one time, will not apply to the same sheep at another, because so much depends on circumstances. A sheep that eats three pounds of hay in a cold day, will not perhaps eat more than two in a warm day following; and still less in a damp one. Not that they require so much more food in cold weather than in warm, but that sudden changes affect their appetites and without injuring their health. Again, a sheep of proper form and inclination to fatten, wilt not need so much nutriment to preserve its flesh, as one of the same weight of a coarse, raw-boned, uneasy make.

Shelter.—It is obvious that housing sheep at night, and providing them during the day a shelter from the rain and sun, must preserve and improve their wool; and also essentially conduce to the health, comfort, and preservation of the animal. Sheds may be cheaply constructed for this purpose.

Folding.—Bakewell observes that the " advantages supposed to be derived from folding sheep are visionary; being in fact no more than robbing a large part of the farm to enrich a small one. Large flocks, even any number, kept together, above one hundred, is a barbarous practice; for in such flocks the strongest will beat

the rest from their food, instead of which the weakest sheep should have the best of food; and, if folding is necessary on farms that have no commons annexed to them, why not have small folds on different parts of the farm, and for those of different kinds, ages or strength, and thereby save the trouble of driving from one part of the farm to another?

Perhaps there is no domestic animal that requires more nice and constant attention than sheep.

The age at which sheep are fattened depends upon the breed, some breeds maturing at an earlier age than others, under the same circumstances; and also in the abundance and quality of the food on which they are reared; a disposition to fatten early as well as a gradual tendency towards that form, which indicates a propensity to fatten, being materially promoted by rich food while the animals are yet in a growing state. On good land, the Leicester wethers are very generally brought to a profitable state of fatness before they are eighteen months old, and are seldom kept for fatting beyond the age of two years. The ewes are commonly fatted after having brought lambs for three seasons, that is, after they have completed their fourth year, and those of smal breeds at from five to seven years of age, according to circum stances.

CHAPTER VIII.

SWINE.

No farm stock, says Mr. Powell, is so little regarded, yet there is none more important, under particular circumstances, than swine. As an appendage to a dairy, their value is generally understood; as a means of increasing and commixing the various items of which barn yard manure is composed, they have not been properly appreciated in this State. In New England, where their management has been more skilfully conducted, and their profits as accurately ascertained, some of the most successful farmers have devoted their attention and the produce of their lands almost exclusively to breeding and fattening hogs. The delicate food which they supply for the tables of the rich, the nutritious and frugal repast which they afford to the industrious poor, would make them, it would be supposed, objects of sufficient regard to produce the sort of attention which the dictates of instinct alone would beget; yet we have scarcely found, except on the estates of a few gentlemen in New England and New York, any thing like an approach to the systematic and regular course, which a profitable piggery, as much as a profitable dairy, requires.

Breeds.—There are many distinct breeds of swine, with peculiarities as determined, and properties as fixed, as those which characterize any race of domesticated quadrupeds known. In England, every county, almost, has a separate breed designated by its name, occasionally affected by the peculiar management of the breeder by whom it has been reared; although in this country, in the common language of the farmer, we hear of the *English breed*, as if it were a distinct race. The Bedfordshire, Berkshire, Suffolk, Staffordshire, and Norfolk, are the families with which we are most familiar, and are, perhaps, best fitted for general use. To Mr. Parsons, and Mr. Prince, of Massachusetts, we are indebted for breeds of pigs, which have been the basis of some of the best crosses we possess. Their varieties, as well as the others which we have enumerated, and most of the families which have been derived from them, do not afford flesh with the fine grain and delicate flavour sought in our mar-

kets. Their carcasses have not sufficent *proportion of muscle to fat*. Some shades of difference have been effected by the introduction of Mr. Cobbett's breed, which, uniting all the perfections of the best of the others, in smallness of bone, early maturity, and great disposition to become fat, possess other advantages—smallness of entrails, great fleshiness in the hands, and great delicacy in the flavour of the meat.

To Commodores Chauncey and Stewart we owe the introduction of some excellent families of Spanish hogs, which, when crossed with those of Mr. Parsons' and Mr. Prince's stock, produce the best variety I have seen. The late Mr. Tomlinson possessed a large stock of swine which he had derived from individuals of the breeds I have named. The high prices at which they were bought at vendue, show the estimation in which they were held by the practical farmers.

Breeding and Rearing.—In the breeding of swine, whatsoever be the variety, the most perfect and best formed boar and sow should be chosen, and a due regard paid to their age, time of copulation, period of gestation, farrowing, castrating, and weaning.

In choosing the boar and sow, regard must be had to their size as well as to the perfection of form. Where food is abundant, or the object of the progeny is the production of bacon and flitches, the larger breeds are to be preferred; but where the food is scarce or uncertain, or rearing for suckled pork, fresh pork, or pickled pork, the smaller breeds are to be preferred. A breeding sow ought to have a large and capacious belly and not to be too much inclined to fat. To check this tendency, some allow them to breed five times in two years.

The age of the Boar should not be less than a year, as he will then be at his full growth, nor that of the female less than ten months. They may be used in breeding for three or five years, and then fed off for the market. The period of gestation in swine is about four months, so that two litters may be easily produced in one year, five in two years, and ten in four years.

The best times for copulation is November and May; because then the progeny are brought forth in mild weather, and when green food is to be had.

The usual produce is from about eight to ten or twelve pigs, in the large, but more in the smaller breeds, which, in general bring the greatest number and most early.

The pregnant cow should be separated from the herd some time before she is expected to farrow, carefully watched and littered with a small quantity of dry short straw. Too much straw is improper, both at the time of farrowing and for a week or two afterwards, as the pigs are apt to nestle beneath it unperceived by the sow, and are thus in danger of being smothered when she

lies down. A breeding sow should be well fed, particularly when nursing; and it is advantageous early to accustom the pigs to feed from a low trough, on milk, or other liquid food mixed with meal or bran. Such of the pigs of both sexes as are not to be kept for breeding, are usually castrated or spayed when about a month old; and the whole may be weaned at the end of six or seven weeks.

To prevent swine from digging in the soil, the best method is to cut the two strong tendons of their snouts with a sharp knife, about an inch and a half from the nose. This may be done with little pain, and no prejudice to the animal, when about two or three months old. The common practice of restraining them by rings fixed in the snout, is painful and troublesome; they must be replaced as often as they give way, and that happens so frequently that rings afford but little security against this nuisance.

It is of great importance that swine of all descriptions, particularly those intended for breeding, should be rendered perfectly tame and gentle, that their inclosures may be entered at all times, and on any occasion, without giving alarm and exciting their resentment. This is easily done by gentle treatment and early accustoming them to the brush or curry-comb. No animal enjoys it more, or derives from it greater benefit. While it increases their comfort, it adds to their health and growth, and serves in a great measure to correct their tempers and dispositions.

While on this subject, I take the occasion to state a fact of which farmers seem not sufficiently aware, which forcibly illustrates the importance of keeping their swine warmly housed in an inclement season. Late in the Autumn I put two shoats, which I had selected for breeders, into a warm inclosure in my barn. Their size and other qualities were of an average with the rest which remained exposed to the weather, except when they returned to their nest. There is at least a third difference in weight in favour of those which are housed, their keeping having been the same.

Fattening of Swine.—It is best to begin to fatten hogs, says a writer, the latter part of August or beginning of September, so that they may be fit for the butcher before the weather becomes very cold, as it is very difficult to put flesh on them in cold weather.

When you commence fattening swine, care should be used not to give them more than they will eat with appetite. If they become cloyed their thriving is retarded, and there is danger from staggers and other diseases. Their troughs should be often re-

plenished with a small quantity of food at a time, and kept always clean and well seasoned with salt.

An English farmer fattened eight pigs in the following manner, which may be recommended in cases where a constant and regular attention cannot be given to feeding the animals. He placed two troughs in the stye: one he filled with raw potatoes, the other with peas, and gave no water. When the pigs were thirsty they ate the potatoes. In this way, it is probable that the animals would not only thrive without water, but needed no antimony, brimstone, or other medical substances; for raw potatoes, being cooling and loosening, might serve at once for food and for physic. Instead of peas, perhaps dry Indian corn, or what would be better, Indian meal, might be substituted.

Cunningham, in his *Two Years in New South Wales*, relates: "I had often heard it said among sailors, that pigs would fatten on coals, and although I had observed them very fond of munching up the coals and cinders that came in their way, still I conceived they might relish them more as a condiment or medicine, than as food, till I was assured by a worthy friend of mine, long in command of a ship, that he once knew of a pig's being lost for several weeks in a vessel he commanded, and it was at last found to have tumbled into the coal-hole, and there lived all that period without a single morsel of any thing to feed on but coals: on being dragged out it was found as plump and fat as if it had been feasting on the most nutritious food. Another friend told me of a similar case, which came under his observation; and although these may be solitary instances, yet they serve, at least, to show the wonderful facility which the stomachs of certain animals possess of adapting their digestive powers to such an extraordinary species of food, and extracting wholesome nourishment therefrom. When we consider coal, however, to be a vegetable production, containing the constituent principles of fat, carbon, hydrogen, and oxygen, our surprise ceases.

I always cause as many peas as I want for feeding my hogs, which are not a few in a year, to be regularly malted in the same manner, nearly, as my barley: this management has succeeded very well with me.

I have frequently given them to my horses, with which they agree very well, and are a heartening food.

Young pigs require *warm* meat to make them *grow*. Corn and cold water will make them sleek and healthy, but warm beverage is considered requisite to a quick growth.

Every stye should have a rubbing post. Having occasion to shift two hogs out of a stye without one, into another with a post, accidentally put up to support the roof, I had a full oppor-

tunity of observing its use. The animals when they went in were dirty, with broken ragged coats, and with dull heavy countenances. In a few days they cleared away their coats, cleaned their skins, and became sleekly haired; *the enjoyment of the post* was discernable even in their looks; in their liveliness and apparent contentment.—*Ibid.*

From experience I have found that swine prefer lucerne to clover. I have experienced that neither lucerne nor clover, of themselves, are sufficient support for swine. A small quantity of corn, peas, or beans, is certainly necessary to be given them.

I have applied potatoes in different modes for feeding swine; giving them whole or mashed in the water wherein they were boiled; or in the last mode, with barley meal scalded and mixed in the trough. But from various and repeated experiments I have found the following the most profitable method of applying potatoes, not only to the rearing, but likewise to the fattening of hogs; varying the quantity given according to the circumstances of rearing and fattening.

When rearing, a small quantity of food given once or twice a day, with lucerne, clover, grass, and offals, is sufficient.

When fattening, a constant supply is essentially necessary, so as not to leave the troughs encumbered with stale food, which should be cleared out and given to store swine.

An iron kettle is the most salutary for boiling potatoes. Should time or convenience not permit to have it emptied for several days, no bad consequences can ensue. Copper, or copper and lead, are extremely dangerous, as they generate poison; therefore they should be immediately emptied and cleaned.

The method I have always adopted, and always shall pursue, until a better is pointed out, is, to fill about three parts of a large kettle with potatoes: I scatter over them about a peck and a half of barley meal, [or Indian meal,] then fill the kettle with potatoes, adding just as much water as will cover them. Then the meal does not sink to the bottom of the kettle, where it will encrust and burn, nor will it be liable to be wasted by boiling over. The nourishment of the meal is in a great degree extracted by the water. After the potatoes are well boiled, let the whole be mixed and bruised in tubs, with a clean spade, so as to form a pulp. By this method, all the nutritive powers of the meal and potatoes are incorporated, and thereby much easier digested, and the hogs require no water.

In cold weather it should be given blood warm. The swine while fattening should be kept as clean as possible, and well supplied with dry litter. Twice or thrice a week, add about three table spoonfuls of salt to each half bushel of their food, which assists digestion and promotes appetite. When too much salt is

given it acts as a purgative, which prevents the deriving of due nourishment from food.

About once a week I have mixed two table spoonfuls of madder, which prevents obstructions, acting as a diuretic and astringent. On some other day in the week, I give a spoonful or two of an equal quantity of flour of sulphur and saltpetre, well pounded and mixed, which purifies and cools the blood. These articles added to the food and given on separate days, entirely prevent measles, keep swine healthy, and cause them to fatten expeditiously.

Hogs from the age of twelve to eighteen months are the most advantageously fed for fattening, as they have then attained their full growth, will require less food, and fatten much more expeditiously than hogs which are younger.

Food which has been rendered acid by fermentation has been frequently recommended in preference to that which is sweet for feeding swine, and we have been told by farmers who have practiced the method that it is very beneficial. In order to effect the desirable degree of fermentation, the following process may be adopted:

Steam or boil potatoes, mash them, and mix with the liquor, while scalding hot, oats, Indian meal, pea meal, or the meal of any other kind of grain. Have ready several tubs or other vessels to receive this wash, when it is fermented *to the proper degree* give it to the animals. It should not stand till it has become very sour; and if the putrid fermentation has commenced it is nearly ruined.

The following mode of procuring acidulated food for swine is pointed out by the celebrated Arthur Young. "Grind the grain to meal, and mix it with water in cisterns made for that purpose, in the proportion of five bushels of meal in a hundred gallons of water; the mass to be well stirred several times each day, till it has fermented and become slightly acid, when it will be ready for use. In this way two or three cisterns must be kept for fermentation in succession; and the profit will more than pay the expense."

Farmers differ much, says another writer, (Mr. Featherstonhaugh, Mem. Board Agr. N. Y.) in their plan of raising holding stock for pork; some permitting their shoats to run at large eighteen months, till they are penned up to fatten; this is the most troublesome and least profitable way; others give them a range in clover pastures, and begin to fatten them earlier. I apprehend there is a much more profitable way, and attended with less trouble, for those who have the right breed. According to the quantity of pork wanted, should be the number of breeding sows kept over, and there should be no other hogs on the farm but the

breeding sows. These, when they pig the latter end of March, should be fed in the most attentive manner, with swill and shorts. The pigs from a full grown sow, will generally be twelve in number; these should be thinned down to eight, and as soon as they begin to feed freely out of the trough, should be weaned, and afterwards fed regularly with green tares, clover, boiled potatoes, ground peas, unmerchantable corn, or any other nourishing food; turning them out every day into a small yard, where there is a shallow pond for them to lie in. A remarkable breed of pigs which had been treated pretty much in this manner, were exhibited at the last Duanesburgh Fair; when eight months old, one of them was slaughtered, and weighed exactly three hundred and eleven pounds; they attracted universal attention, and I certainly never saw such animals before. This method, as it is attended with as little trouble, and leaves so small a quantity of stock on hand to winter over, appears to me to be more economical in every point of view, than any other which is practised.

Diseases of Swine.—Swine are subject to various diseases, but, according to Lawrence, they are not easily doctored.

They are subject, he says, to pox, or measles, blood-sticking, staggers, quinsey, indigestion, catarrh, peripneumonia, and inflammation of the lungs, called heavings. When sick pigs will eat, they will take medicine in their wash; when they will not eat, there is no help for them. As aperients, cleansers, and alteratives, sulphur, antimony, and madder, are our great specifics, and they are truly useful. As cordials and tonics, treacle and strong beer, in warm wash, and good peas and pollard. In the measles, sulphur, &c., and if the patient requires it, give cordials now and then. In staggers, bleeding, fresh air, and perhaps nitre. In catarrh, a warm bed, and warm cordial wash; and the same in quinsey or inflammation of the glands in the throat. If external suppuration appear likely, discharge the matter when ripe, and dress with tar and brandy or balsam. The heavings or unsoundness of lungs in pigs, like the unsoundness of liver in lambs, is sometimes found to be hereditary; there is no remedy. This disease in pigs is often the consequence of colds from wet lodgings, or of hasty feeding in a poor state; in a certain stage it is highly inflammatory, and without remedy. Unction with train oil, and the internal use of it, have been sometimes thought beneficial.

CHAPTER IX.

POULTRY.

Though poultry form a very insignificant part of the live stock of a farm, yet they ought not to be altogether despised. In the largest farms a few domestic fowls pick up what might escape the pigs and be lost; and on small farms the breeding and rearing of early chickens and ducks, and in some situations, the rearing of turkeys and the keeping of geese, are found profitable. There are few who do not relish a new egg or a pancake, not to say the flesh of fowls; and there are some of these comforts which can easily be had.

The various kinds of domestic fowls may be classed as *gallinaceous*, or with a cleft foot; and *anserine* or web footed.

Among the former are—the common hen, turkey, Guinea fowl, and peacock.

The latter comprehends—the duck, goose, swan, and buzzard.

Breeding and rearing chickens.—It should be a general rule to breed from young stock: a two year old cock, or stag, and pullets in their second year. Pullets in their first year, if early birds, will indeed, probably, lay as many eggs as ever after, but the eggs are small, and such young hens are unsteady sitters. Hens are in their prime at three years of age, and decline after five, whence generally it is not advantageous to keep them after that period, with the exception of those of capital qualifications. Hens with a large comb, or which crow like the cock, are generally deemed inferior; but I have had hens with large rose combs, and also crowers, which were upon an equality with the rest of the stock. Yellow-legged fowls are often of a tender constitution, and always inferior in the quality of their flesh, which is of a loose flabby texture and ordinary flavour.

The health of fowls is observable in the fresh and florid colour of the comb, and the brightness and dryness of the eyes, the nostrils being free from any discharge, and the plumage of a healthy gloss. The most useful cock is generally a bold, active, and savage bird, cruel and destructive in his fits of passion, if

not well watched, to his hens, and even to his own offspring. Hens above the common size of their respective varieties, are by no means preferable either as layers or sitters. The indications of old age are paleness of the comb and gills, dullness of colour, and a sort of downy stiffness of the feathers, and length and size of their talons, the scales upon the legs becoming large and prominent.

The number of hens to one cock, four to six, the latter being the extreme number, with a view of making the utmost advantage. Ten and even twelve hens have been formerly allowed to one cock, but the produce of eggs and chickens under such an arrangement will seldom equal that to be obtained from the smaller number of hens. Every one is aware, that the Spring is the best season to commence breeding with poultry, and in truth, it scarcely matters how early, pre-supposing the best food, accommodation and attendance, under which hens may be permitted to sit in January.

In the hatching of poultry, as in most other things, nature is the best guide. The hen and duck, if left to themselves, find some warm, dry, sandy hedge or bank, in which to deposit their eggs, forming their nests of leaves, moss, or dry grass. In this way the warmth is retained when the bird quits the nest for the moments she devotes to her scanty and hurried meal. The good housewife's mode is the reverse of this. She makes a nest, or box, of stone, brick, or wood, and fills it with clean long straw. By these means less heat is generated by the hen, and that which is produced quickly escapes in her occasional absence; the eggs are chilled and addled, and frequent failures ensue in the expected brood, To obviate this, the best mode is to put at the bottom and sides of the boxes of the hen-house, a sufficient quantity of fine dry sand, or of coal or wood ashes, lining them with a little well broken dry grass, or untwisted hay bands, or moss, or bruised straw. Wood ashes have been found to be the best, as they produce the effect of destroying the fleas, by which poultry are much infested; and that this will not be disagreeable to them, is evident from the propensity which they have to roll in heaps of dust or of ashes of any kind. An experienced rearer of poultry adopted the method above described during a long course of years, and scacely ever met with a disappointment.

The common deep square boxes, uncovered at the top, are extremely improper for nests, because that form obliges the hen to jump down upon her eggs; whereas, for safety, she should descend upon them from a very small height, or in a manner walk in upon them. Hens sit twenty days.

In making the nests, short and soft straw is to be preferred, because the straw being long, the hen, on leaving her nest, will

be liable to out draw it with her claws, and with it the eggs. The hen, it is ascertained, will breed and lay eggs without the company of a cock; of course, such eggs are barren.

Eggs for sitting should never exceed the age of a month, the newer to be preferred, as nearly of a size as possible, and of full middle size; void of the circular flaw which indicates the double yolk, generally unproductive, nor should there be any roughness or cracks in the shells. Number of eggs, according to the size of the hen, from nine to fifteen, an odd number being preferable, on the supposition of their lying more close. The eggs to be marked with a pen and ink, and examined when the hen leaves her nest, in order to detect any fresh ones which she may have laid, and which should be immediately taken away from her, as they, if at all, would be hatched too late for the brood. It is taken for granted, the box and nest have been made perfectly clean for the reception of the hen, and that a new nest has not been sluttishly and sluggishly thrown upon an old one, from the filth of which vermin are propagated, to the great annoyance of the hen, and prevention of her steady sitting.

Eggs broken in the nest should be cleared away the instant of discovery, and the remaining washed with warm water, and quickly replaced lest they adhere to the hen, and be drawn out of the nest: if necessary, the hen's feathers may also be washed, but always with warm water.

It is proper to place corn and water beside the sitting hen, whenever it may appear necessary, withdrawing them as soon as she is satisfied, not only to encourage steadiness of incubation, but to support the constitution of those in which the natural excitement is so powerful, that they will remain several successive days upon the nest, at the risk of famishing.

The chickens first hatched are to be taken from the hen, lest she be tempted to leave her task unfinished. Those removed may be secured in a basket of wool or soft hay, and kept in a moderate heat; if the weather be cold, near the fire. They will require no food for many hours, even four and twenty, should it be necessary to keep them so long from the hen. The whole brood being hatched, the hen is to be placed under a coop abroad upon a dry spot, and, if possible, not within the reach of another hen, since the chickens will mix, and the hens are apt to maim or destroy those which do not belong to them. Nor should they be placed near numbers of young fowls, which are likely to crush young chicks under their feet, being always eager for chicken's meat.

Feeding and fattening chickens and fowls.—The points for consideration on this branch of the subject are—the local conveniences, the modes, common or extraordinary, the variety and

quality of the food, and the length of time necessary for the completion of the object.

The well-known common methods are, to give fowls the run of the farm yard, where they thrive upon the offals of the stable, and other refuse, with perhaps some small regular daily feeds; but at thrashing time they become fat, and are thence styled *barn-door fowls*, probably the most delicate and highly-flavoured of all others, both from their full allowance of the finest corn, and the constant health in which they are kept, by living in the natural state, and having the full enjoyment of air and exercise; or they are confined during a certain number of weeks, in coops, those fowls which are soonest ready being drawn as wanted. It is a common practice with some house-wives to coop their barn door fowls for a week or two, under the notion of improving them for the table and increasing their fat; a practice which, however, seldom succeeds, since the fowls generally pine for the loss of liberty, and, slighting their food, losing instead of gaining additional flesh. Such a period, in fact, is too short for them to become accustomed to confinement.

Feeding-houses, at once warm and airy, with earth floors well raised, and capacious enough to accommodate twenty or thirty fowls, are best. The floor may be slightly littered down, the litter often changed, and the greatest cleanliness should be observed. Sandy gravel should be placed in several different layers, and often changed. A sufficient number of troughs, for both water and food, should be placed around, that the stock may feed with as little interruption as possible from each other, and perches in the same proportion should be furnished for those birds which are inclined to perch, which few of them will desire, after they have begun to fatten, but which helps to keep them easy and contented until that period. In this mode fowls may be fattened to the highest pitch, and yet presorved in a healthy state, their flesh being equal in quality to that of the barn-door fowl.

A feeding yard, gravelled and sown with common trefoil, or wild clover with a quantity of burnet, starry or star-grass, the feeding-houses being open all day for the fowls to retire at pleasure, will have a decided preference, as the nearest approach to the barn-door system.

Insects and animal food, also, form a part of the natural diet of poultry, are medicinal to them in a weakly state, and the want of such food may sometimes impede their thriving.

In the Winter season hens should be allowed to have access to slacked lime, pounded bones, oyster shells, or gravel. This, it is said, will keep them in a laying condition through the season.

Diseases.—The diseases of domestic animals kept for food,

are generally the result of some error in the diet and management, and should either have been prevented, or are to be cured most readily and advantageously by an immediate change and adoption of the proper regimen. Of these the most frequent diseases, real or presumed, are thus named:—The *pip*, a white skin or scale growing upon the tip of the tongue. The cure,—tear off the skin with your nail, and rub the tongue with salt. Imposthume upon the rump is called *roup*. This is directed to be opened, the core thrust out, and the part washed with salt and water. The roup also seems a general term for all diseases, but is chiefly applied to *catarrh*, to which gallinaceous fowls are much subject. The *flux* and its opposite, *constipation*. Cure the first with good solid food; the other with scalded bran or pollard, mixed with flet or skimmed milk, or pot-liquor, a small quantity of sulphur being added, if needful. *Vermin*, generally the consequence of low keep, the want of cleanliness. The remedy obvious; not to forget sand and ashes for the fowls to roll in.

But the chief disease to which chickens and fowls are liable, originates in changes of weather, and the variation of temperature; and when the malady becomes confirmed, with rolling at the nostrils, swollen eyes, and other well-known symptoms, they are termed roupy. The discharge becoming fœtid, like the glanders in horses, the disease is supposed to have arrived at the stage of infection; and whether so or not, it is certainly proper for cleanliness sake, to separate the diseased from the healthy, whence the necessity of an infirmary in a regular poultry establishment. Roupy hens seldom lay, and their eggs are scarcely wholesome. The eggs taken from a hen which died of the roup, were black and in a state of putrifaction.

Chickens are frequently, and chiefly in bad weather, seized with the chip, in about three weeks from their hatching, when all their beauty of plumage vanishes, and they put on their long great coat, or rather shroud, and sit *chipping*, pining, and dying in corners; always apparently in torture, from a sense of cold, although to the touch they seem in a high state of fever. This disease seldom admits of remedy; but I have tried mustard in water, crams, with a small quantity of black pepper, and afterwards nitre, given in the water. The sun, or warmth in the house, by the fire-side, are the best remedies. The fire is a great restorative of all young animals.

For grown fowls affected by the roup, warm lodging is necessary, and even the indulgence of the fire and the warmth of the bakehouse Wash the nostrils with warm soap and water, as often as necessary, and the swollen eyes with warm milk and water. A pepper-corn in a pill of dough, three following days, is an

old and favourite remedy, the patient being much chilled. Afterwards bathe the swollen parts with camphorated spirit, or brandy and warm water. As a finish to the cure, give sulphur in the drink, or a small pinch of calomel in dough, three times in a week. The fowls being weak and not feeding well, the old remedy of rue chopped and made into pills with fresh butter, may be substituted for calomel.

The common symptom of gaping during this influential disease induced the learned, a few years past, to coin a new disease under the name of *gapes*, which they conveniently attributed to a species of *fasciola*, or stricture infecting the *trachea*, or wind-pipe, of poultry. Pheasants and partridges, in their wild state, are also liable to the gapes, and from the same atmospheric cause.

To prevent fowls from being attacked with gapes, some say "take a piece of assafœtida about the size of a hen's egg, beat it tolerably flat, and wrap a piece of cotton cloth round it, and nail it to the bottom of the trough where the hens are daily watered;" this method adopted in the Spring of the year, when the hens begin to bring forth their young broods, will be attended with invariable success in preventing that destructive disorder.

Another remedy is, "to take as much kitchen soap as will cover the thumb nail, and having mixed it up with some meal dough, give it to your chickens at any stage of the disease. This has been found effectual on the first application almost always; a second is rarely necessary, and when it is so, it is next to impossible that it should fail.

THE TURKEY.—One turkey-cock is sufficient for six hens, and even more, under the management of some districts, where one breeder keeps a cock for his own, and the use of his neighbours, who send their hens, and in that mode avoid the charge of keeping a cock. But this practice is exposed to uncertainty, and is scarcely worth following, although, whilst the hen is sitting, the absence of a cock is no loss, as he will sometimes find the opportunity of tearing the hen from her nest, and in the struggle, of destroying the eggs.

The hen will cover, according to her size, from nine to fifteen eggs, and unless attended to, will, perhaps, steal a nest abroad in some improper and insecure place. The turkey hen lays a considerable number of eggs in the Spring, to the amount of eighteen to twenty-five and upwards, and her term of incubation is thirty days. She is a most steady sitter, and will sometimes continue upon her eggs until almost starved, rather than quit her nest: hence the necessity of constant attendance with both victuals and water.

The chicks must be withdrawn from the nest as soon as hatch-

ed, and kept very warm. It is a very old and very general custom to plunge them instantly into cold water, and then give them each a whole pepper-corn, with a small tea-spoonful of milk. This baptism is used by way of a preventive against catching cold, to which young chicks are so peculiarly liable; but it is a practice which I have never used, and from which, in severe weather, I should suspect danger; however, their being instantly thereafter wrapped in wool or flannel may secure them. The turkey, from sitting so close and steadily, hatches more regularly and quickly than the common hen.

The hen and brood must be housed during a month or six weeks, dependent upon the state of the weather, First food, curd or eggs boiled hard and chopped, and oat and barley-meal kneaded with milk, and frequently renewed with clear water rather than milk, which often scours them. In case of the chicks appearing sickly and the feathers ruffled, indicating a chill from severity or change of weather, we generally allowed half ground malt with the barley-meal, and by way of a medicine, powdered carraway or coriander seeds.

Cobbett's Cottage Economy contains the following remarks:

"The great enemy to young turkeys, (for old ones are hardy enough), is the wet. The first thing is to take care that young turkeys never go out on any account, even in dry weather, till the *dew is quite off the ground;* and this should be adhered to till they get to the size of an old partridge, and have their backs well covered with feathers, and in wet weather they should be kept under cover all day long.

"As to feeding them when young, various nice things have been recommended. Hard eggs, chopped fine with crumbs of bread, and a great many other things; but that which I have seen tried, and always with success, and for all sorts of poultry, is *milk turned to curds*. This is food for young poultry of all sorts. Some should be made fresh every day, and if this be done, and the young turkeys kept warm, especially from wet, not one of a score will die. When they get strong, they may have meal and grain, but still they always love the curds.

"When they get their head feathers they are hardy enough, and what they want is room to prowl about. It is best to breed under a common hen, because she does not ramble like a hen turkey; and it is a very curious thing, that the turkeys bred up by a hen of the common fowl do not themselves ramble much when they get old; than which a more complete proof of the great power of habit is not, perhaps, to be found. And ought not this to be a lesson to fathers and mothers of families? Ought they not to consider that the habits which they give to children are to stick to them during their whole lives?

"The hen should be fed exceedingly well too, while she is sitting and after she has hatched; for, though she does not give milk, she gives heat; and let it be observed, that as no man ever yet saw healthy pigs with a poor sow, so no man ever saw healthy chickens with a poor hen. This is a matter much too little thought of in the rearing of poultry; but it is a matter of the greatest consequence. Never let a poor hen sit; feed the hen while she is sitting; and feed her most abundantly when she has young ones; for then her labour is very great; she is making exertions of some sort or other during the whole twenty-four hours; constantly doing something or other to provide food or safety to her young ones.

"As to fatting turkeys, the best way is never to let them be poor. Barley meal, mixed with skim milk, and given to them fresh, will make them fat in a short time. Boiled carrots and Swedish turnips will help and furnish a change of sweet food."

The Duck.—One drake is generally put to five ducks; the duck will cover from 11 to 15 eggs, and her term of sitting is thirty days. Ducks begin to lay in March, in the middle and northern parts of the United States; are very prolific, and are apt, like the turkey, to lay abroad, and conceal their eggs, by covering them with leaves or straws.

The duck generally lays by night, or early in the morning; white and light coloured ducks produce similar eggs, and the brown and dark coloured duck those of a greenish blue colour, and of the largest size. In sitting ducks, it is considered safest to put light coloured eggs under light ducks, and the contrary, as there are instances of the duck's turning out with her bill those eggs, which were not of her natural colour.

During incubation the duck requires a secret and a safe place rather than any attendance, and will, at nature's call, cover her eggs, and seek her food, and the refreshment of the waters. On hatching there is not often any necessity for taking away the brood, barring accidents; and having hatched, let the duck retain her young upon the nest her own time. On her moving with her brood, prepare a coop upon the short grass, if the weather be fine, or under shelter, if otherwise; a wide and flat dish of water, often to be renewed, standing at hand—Indian or any meal the first food. In rainy weather, particularly, it is useful to clip the tails of the ducklings and the surrounding down beneath, since they are else apt to draggle and weaken themselves. Each duck should be cooped at a distance from any other. The period of her confinement to the coop depends on the weather, and the strength of the ducklings. A fortnight seems the longest time necessary; and they may be sometimes permitted to enjoy the

ning, which the good house-wife sees no more. It is also necessary to destroy all the hemlock or deadly night-shade, within the range of young geese, many of which drop off annually, from eating that poison, when the cause is not suspected. I know not that the elder geese will eat hemlock, but I believe that both the young turkeys and older have been occasionally killed by swallowing slips of yew. The young becoming pretty well feathered, will also be too large to be contained or brooded beneath the mother's wings, and will then sleep in groups by her side, and must be supplied with good and renewed straw beds, which they convert into excellent dung. Being now able to frequent the pond, and range the common at large, the young geese will obtain their living, and few people, favorably situated, allow them any thing more, excepting the vegetable produce of the garden.

It has, however, been my constant practice, always to dispense a moderate quantity of any solid corn or pulse at hand, to the flocks of store geese, both morning and evening, on their going out and return, in the evening more especially, together with such greens as chance to be at command: cabbage, mangold leaves, lucern, tares, and occasionally sliced carrots and turnips. By such full keeping our geese were ever in a fleshy state, and attained a large size; the young ones were also forward and valuable breeding stock.

Geese managed on the above mode will be speedily fattened green, that is, at a month or six weeks old, or after the run of corn stubbles. Two or three weeks after, the latter must be sufficient to make them thoroughly fat; indeed, I prefer a goose fattened entirely in the stubbles, granting it to have been previously in good case, and be full fed in the field; since an over-fattened goose is too much in the oil-cake and grease-tub style to admit even the idea of delicacy, tender firmness, or true flavour. But when needful to fatten them, the feeding-houses already recommended are most convenient. With clean and renewed beds of straw, plenty of clean water, and on oats crushed or otherwise, or Indian-meal, geese will fatten pleasantly and speedily Very little greens of any kind should be given to fatten geese, as being too laxative, and occasioning them to throw off their corn too quickly; whence their flesh will prove less substantial and of inferior flavour. Greens are the more proper food for store geese.

FINIS.